REPORT ON

MACKENZIE NORTH PROJECT ANNUAL GROUNDWATER MONITORING REPORT 2024 YEAR

For: Jellinbah Group Pty Ltd

Project number: 4159

Date: 28/02/2025

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Mackenzie North Project - Annual Groundwater Monitoring Report 2024 Year

Prepared for

Jellinbah Group Pty Ltd

1. Introduction

This Annual Groundwater Monitoring Report (AGMR) for the Mackenzie North Project (the Project) has been prepared by **hydrogeologist.com.au** on behalf of the Jellinbah Group Pty Ltd (Jellinbah) to satisfy the conditions of the Project Environmental Authority (EA) EPML00516813 (dated 8 September 2022), specifically:

- *Condition I16 – an Annual Groundwater Monitoring Report (AGMR) must be completed by 1 March each year; and*
- *Condition I17 – The AGMR required by Condition I16 must include:*

  a) a review of all the groundwater quality and SWL data of all groundwater bores listed within Table I1 – Groundwater quality monitoring locations and frequency and Table I4 – Groundwater standing water level monitoring locations, frequency and triggers;

  b) an assessment of groundwater quality and SWL trends for all data from all groundwater bores listed in Table I1 – Groundwater quality monitoring locations and frequency and Table I4 – Groundwater standing water level monitoring locations, frequency and triggers;

  c) an assessment of any impacts on groundwater level due to the mining activities; and

  d) comparison with receiving environment surface water quality monitoring results to determine any interaction or impact from groundwater on surface water.

This Annual Groundwater Monitoring Report covers the period 1 January 2024 to 31 December 2024, but references earlier data as required for analysis of groundwater level and groundwater quality trends.

2. Geology and hydrogeology

The geology and hydrogeology of the Mackenzie North Project area has been reported in AGE (2013)[1]. Relevant elements are summarised below to provide background and context to the groundwater data review.

The Project is located within the central part of the Bowen Basin, an early Permian to middle Triassic-age basin that covers an area of approximately 160,000 km^2. Table 2-1 shows the stratigraphic relationship and description of strata that occur within the Project Area, which include Bowen Basin strata (Late Permian Burngrove Formation and Rangal Coal Measures, and the Triassic Rewan Sub-group) that are overlain by Quaternary / Tertiary alluvium. Figure 2-1 shows the Bowen Basin solid geology[2] for the Project area. The Project area is underlain by strata of the Rangal Coal Measures, with the underlying Burngrove Formation occurring in the west of the Project area and the overlying Rewan Sub-group occurring in the eastern and south-eastern area of the Project. The Rangal Coal Measures contain the target coal seams for mining at Mackenzie North, i.e. the Pollux Upper seam and the Pollux Lower seam.

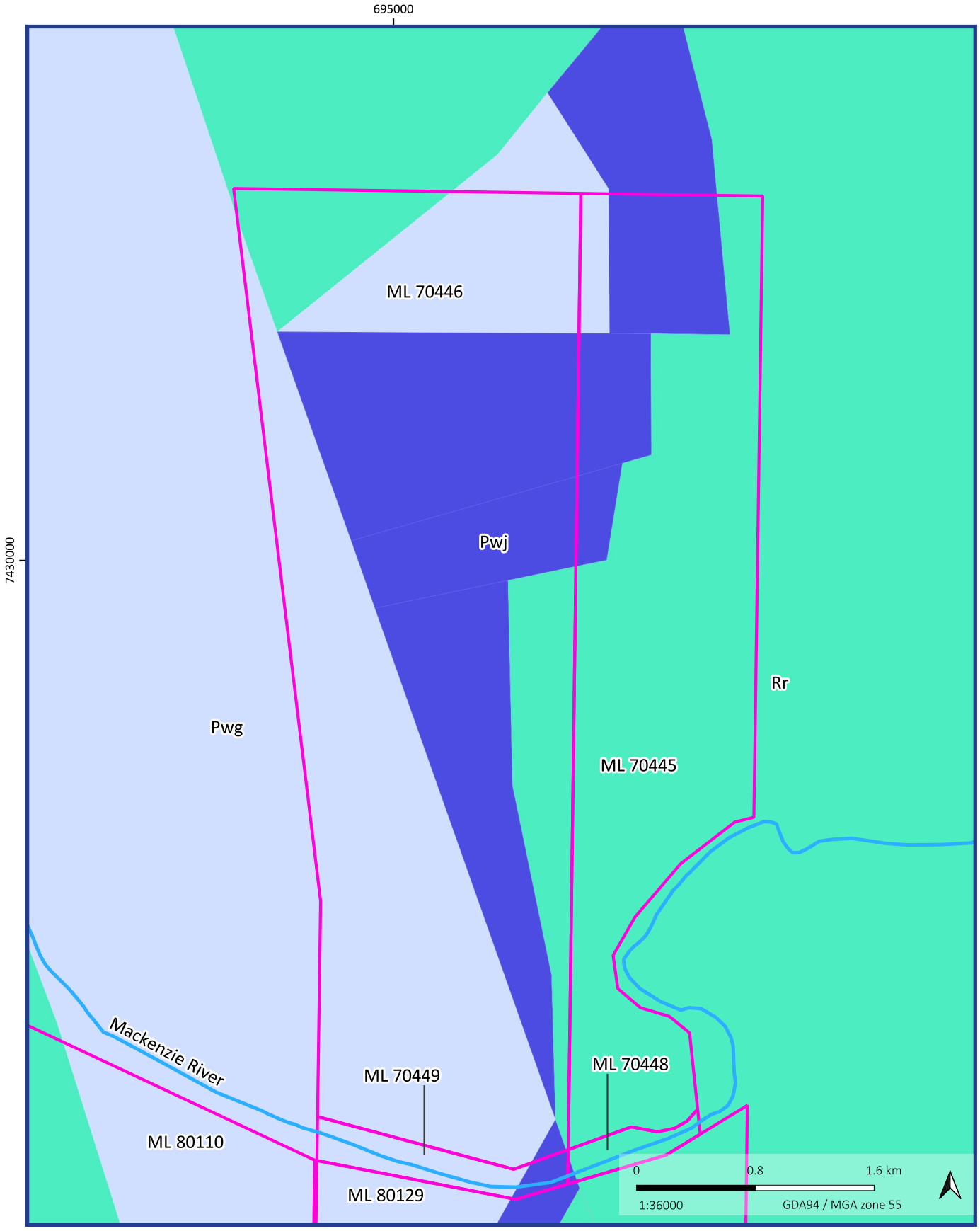
The Permian and Triassic strata are overlain by unconsolidated Quaternary and Tertiary alluvium, with the Quaternary-age alluvial sediments associated with current channels and paleochannels of the Mackenzie River floodplain. The surface geology of the project area is shown on Figure 2-2. The Project area is underlain by Quaternary alluvium, which is deposited directly over strata of the Rangal Coal Measures in the central part of the Project area (the majority of the proposed disturbance area for the Project).

Table 2-1 Stratigraphy of the Mackenzie North Project (after AGE, 2013)

Geological age	Unit	Lithology	Thickness (m)
Quaternary / Tertiary	Alluvium	Unconsolidated soil, silty clay, sand, and gravel. The basal sand and gravel thickens towards the Mackenzie River.	~14 m to 42 m
Triassic	Rewan Sub-group	Green-grey claystone, siltstone and sandstone with a minor pebbly conglomerate unit at its base.	0 m to 100 m
Late Permian	Rangal Coal Measures	Feldspathic and lithic sandstone, carbonaceous mudstone, siltstone, tuff, and coal seams. Coal seams include: - Castor - Pollux Upper - Pollux Lower	100 + m
		- Aries	0 – 2.2 m
		- Castor	0 – 1.1 m
		- Pollux Upper	0 – 7.6 m
		- Pollux Lower	0 – 6.4 m
	Burngrove Formation	Sandstone, siltstone, mudstone and banded coal seams, frequently interbedded with tuff and tuffaceous mudstone.	>200 m

[1] Mackenzie North Groundwater Assessment. Report prepared for Australasian Resource Consultants Pty Ltd (AARC) by Australasian Groundwater and Environmental Consultants (AGE). Project No. G1512, May 2013.

[2] In the Bowen Basin solid geology map the surficial unconsolidated Quaternary and Tertiary geology has been stripped off to reveal the relationship of the underlying Triassic and Permian sediments. Data source: Bowen Basin Structural Geology 2008. Geological map and digital dataset prepared by Sliwa, R., Hamilton, S., Hodgkinson, J. & Draper, J., copyright CSIRO and Queensland Department of Mines and Energy, 2008.



©2025 Oasis Hydrogeology Pty Ltd - trading as hydrogeologist.com.auSource: 1 second SRTM Derived DEM-S - © Commonwealth of Australia (Geoscience Australia) 2011.; GEODATA TOPO 250K Series 3 - © Commonwealth of Australia (Geoscience Australia) 2006.\\HYDRO-NAS\Data\4000_Projects\4159D_Jellinbah_Mackenzie North Annual GW Monitoring Report\3_GIS\3_11_Workspaces_QGIS\4159D_Figure 2-1 Solid geology.qgz

Solid geology

Legend

- Mackenzie River
- Mining leases
- Fault
- Pwg - Burngrove Formation
- Pwj - Rangal Coal Measures
- Rr - Rewan Sub-group

(4159D) Mackenzie North Project
Annual Groundwater Monitoring Report 2024

Figure 2-1

25/02/2025

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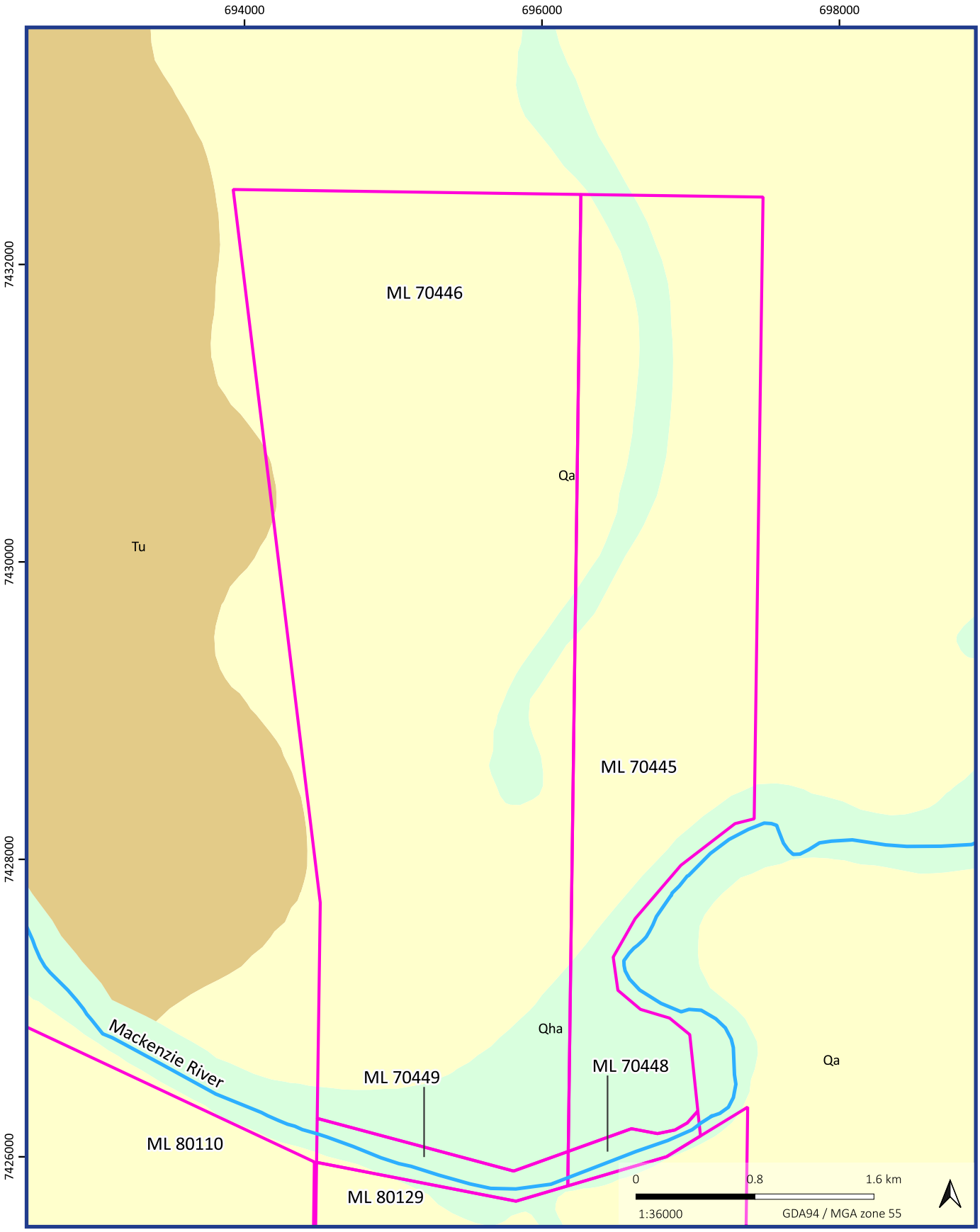

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Surface geology

Legend

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Annual Groundwater Monitoring Report 2024

Figure 2-2

25/02/2025

Geology

- Qa - Alluvium (clay, silt)
- Qha - Alluvium (sand, gravel)
- Tu - Duaringa Formation

- Mackenzie River
- Mining leases

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3. Rainfall data

Rainfall data for the Project has been obtained from the Queensland Government SILO Data Drill website, for a location that corresponds to the centre of the Project. The SILO data accesses grids of climate data available from surrounding Bureau of Meteorology (BoM) point observations and then creates interpolated climate values for the requested location. The interpolated climate data are calculated for the requested location using splining and kriging techniques, based on the proximity of surrounding BoM point observations.

Monthly rainfall data is shown below in Figure 3-1. Figure 3-1 also presents a Cumulative Rainfall Departure (CRD) curve for the data. The CRD is calculated by subtracting the long-term average monthly rainfall from the actual monthly rainfall, to provide a monthly "departure" from average conditions. If the monthly rainfall is above average, the resulting rainfall departure number is positive, whereas if the rainfall is below average, the number is negative. A number of below-average rainfall months will result in a falling CRD curve, while a number of above average rainfall months will result in a rising CRD curve. The CRD curve is used extensively in groundwater assessments due to the strong correlation in many locations between the CRD and groundwater level trends.

The CRD curve shows an upward trend from 2010 to 2012 due to above-average rainfall over that period but has been in decline due to generally below-average rainfall conditions from 2012 to 2021. The overall trend of the CRD curve has been rising from January 2021 to December 2024. This rise is primarily driven by multiple above-average rainfall events in November 2021, May 2022, October 2022, December 2022, as well as January, November and December of 2024.

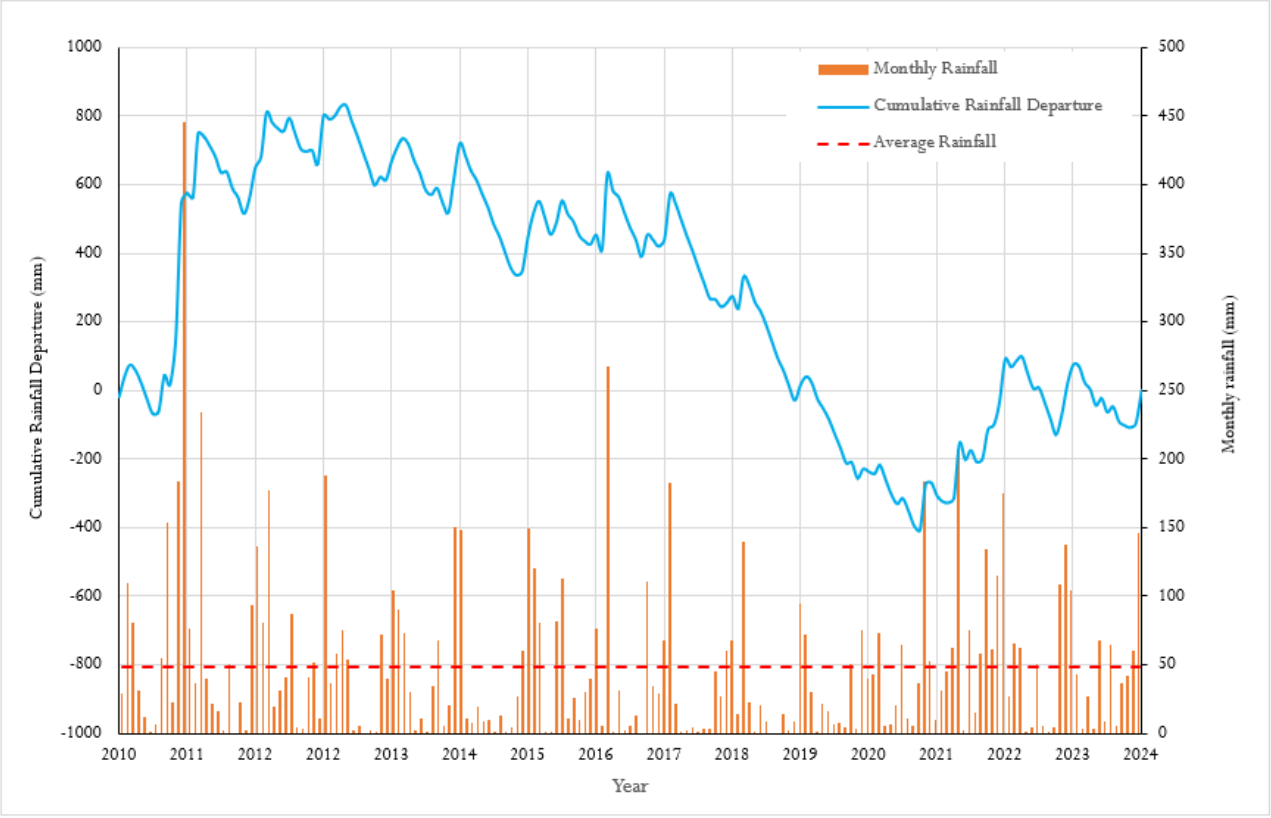


Figure 3-1 Monthly rainfall data and cumulative rainfall departure

4. Groundwater monitoring bores

4.1. Description of monitoring network

The groundwater monitoring network comprises twelve bores at nine sites as shown below in Table 4-1. Eight bores monitor groundwater within the alluvium, with four bores in the Permian coal measures (three within the Pollux seam and one within the Permian overburden). Monitoring sites and monitoring purpose are shown in Table 4-1 and bore locations (as well as surface water monitoring points that are discussed in Section 6) are presented in Figure 4-1.

All existing bores in the monitoring network were assessed in August/September 2018 for bore integrity, and confirmation of bore depth, and were re-developed prior to commencement of water quality and water level sampling.

The three alluvial monitoring bores that are located between the mining operation and the Mackenzie River (JMR4WA, JMR24WA and JMR25WA) have been fitted with dataloggers.

Table 4-1 Mackenzie North groundwater monitoring bores

Monitoring bore	Hydrogeological unit	Easting	Northing	Surface RL (mAHD)	Screened interval (mbgl)		Bore purpose and monitoring frequency[1]	
					From	To	Water quality	Water level
JMR22WP	Permian-Pollux seam	697115	7429826	122.2	157	163	Interpretation	Compliance
JN1119E	Permian-Pollux seam	697068	7430176	121.38	140	146	Interpretation	Compliance
JMR23WA	Alluvium	697214	7428283	122.3	17.2	20.2	Interpretation	Compliance
JMR4WA	Alluvium	695949	7427175	123.8	36	42	Compliance	Compliance
JMR4WP2	Permian-Pollux seam	695952	7427176	124	83.5	88	Compliance	Compliance
JMR24WP2	Permian overburden	697305	7432067	120.5	72.8	78.8	Compliance	Compliance
JMR25WA	Alluvium	696363	7427544	122.5	17.9	20.9	Compliance	Compliance
JP0911T	Alluvium	694540	7425880	124.86	22	28	-	Interpretation
JP0912T	Alluvium	697270	7426150	122.56	36	42	-	Interpretation
JMR26WA	Alluvium	696550	7425800	123.4	18.2	21.2	-	Interpretation
JMR22WA	Alluvium	697111	7429809	122.2	14.5	17.5	-	Compliance
JMR24WA	Alluvium	697303	7432067	120.4	14.8	17.8	-	Compliance

Notes: *Coordinates are in GDA94 Zone 55.*

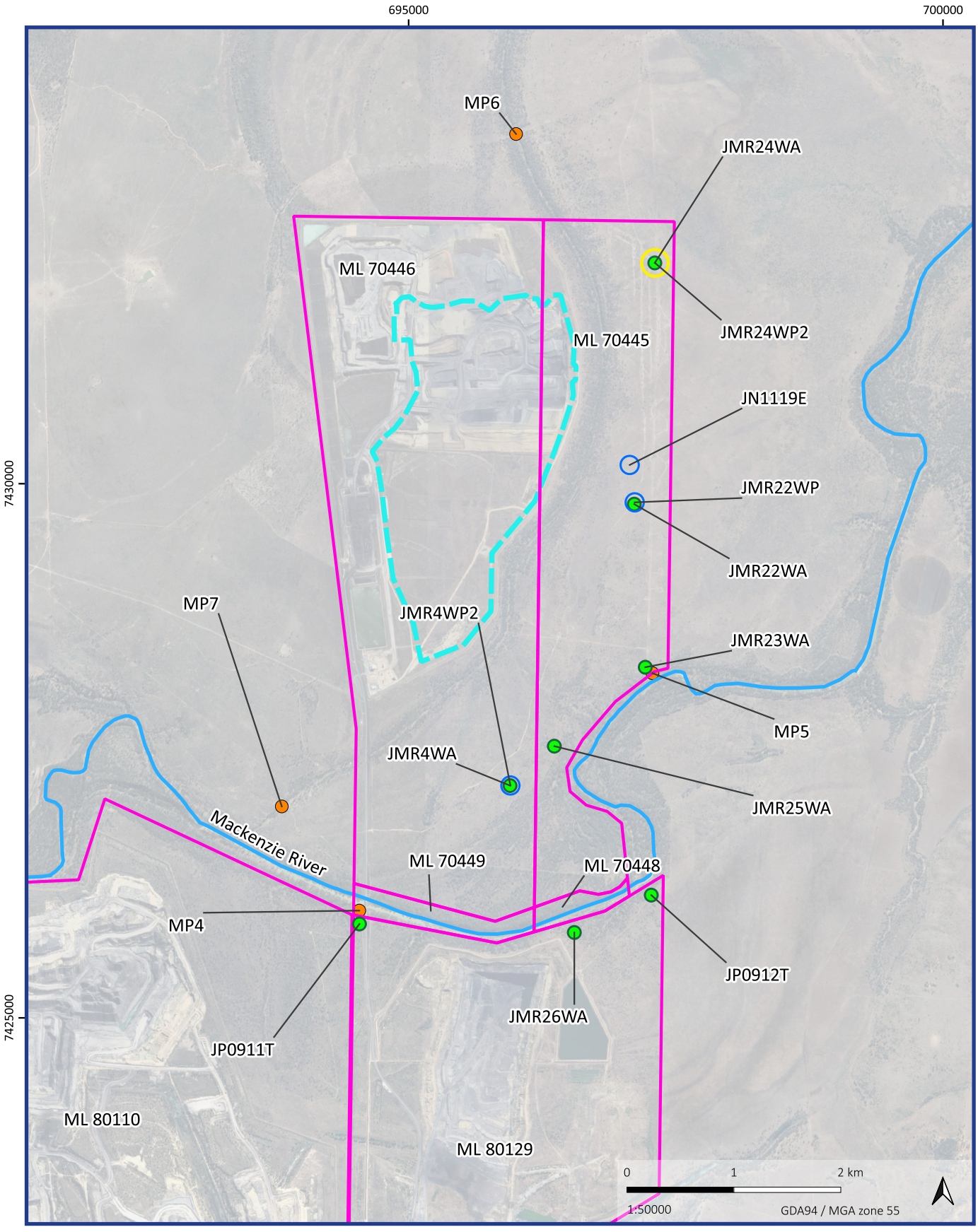
mAHD – metres above Australian Height Datum

mbgl – metres below ground level

1. For bores where monitoring is shown to be required (i.e. for Interpretation or Compliance purposes), the monitoring frequency is quarterly, i.e. every 3 months.

4.2. Changes to monitoring bore network

No new groundwater bores were drilled, and no bores were decommissioned during the reporting period, i.e. there were no changes to the monitoring bore network from 1 January 2024 to 31 December 2024.



©2025 Oasis Hydrogeology Pty Ltd - trading as hydrogeologist.com.auSource: 1 second SRTM Derived DEM-S - © Commonwealth of Australia (Geoscience Australia) 2011.; GEODATA TOPO 250K Series 3 - © Commonwealth of Australia (Geoscience Australia) 2006.\\HYDRO-NAS\Data\4000_Projects\4159D_Jellinbah_Mackenzie North Annual GW Monitoring Report\3_GIS\3_11_Workspaces_QGIS\4159D_Figure 4-1_Groundwater bore and surface water monitoring locations.qgz

Groundwater bore and surface water monitoring locations

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Annual Groundwater Monitoring Report 2024

Figure 4-1

25/02/2025

Legend

- Surface water
- Mackenzie River
- Limit of Mining
- Mining leases

Bore

- Alluvium
- Permian-Pollux seam
- Permian overburden

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5. Groundwater monitoring

5.1. Groundwater quality monitoring

5.1.1. Monitoring requirements

Groundwater quality monitoring is undertaken at the bore sites and monitoring frequency shown in Table 4-1 and for the parameters shown below in Table 5-1 and Table 5-2.

Table 5-1 Groundwater quality limits (reproduced from EA Table I2)

Monitoring bore	Groundwater quality characteristic limit		
	pH (pH units)	EC (µS/cm)	Sulphate (mg/L)
JMR4WA	6.37 - 8.6	6,900	103
JMR4WP2		9,590	60
JMR24WP2		10,490	20
JMR25WA		2,200	16

Table 5-2 Groundwater contaminant limits (reproduced from EA Table I3)

Quality parameter	Unit	Groundwater limit
Total dissolved solids (TDS)	mg/L	No specified limit - interpretative purposes only
Major anions (Ca, K, Mg, Na)	mg/L	No specified limit - interpretative purposes only
Major cations (Cl, OH, CO_2, HCO_3)	mg/L	No specified limit - interpretative purposes only
Dissolved Metals/Metalloids		
Aluminium	(µg/L)	55
Arsenic	(µg/L)	13
Chromium	(µg/L)	1.0
Cobalt	(µg/L)	1.4
Copper	(µg/L)	2
Manganese	(µg/L)	1900
Molybdenum	(µg/L)	34
Nickel (µg/L)	(µg/L)	211 (Permian bores: JMR22WP, JN1119E, JMR4WP2, and JMR24WP2))
		221 (Alluvium bores: JMR23WA, JMR4WA, and JMR25WA)
Selenium	(µg/L)	10
Zinc	(µg/L)	154 (Permian bores: JMR22WP, JN1119E, JMR4WP2, and JMR24WP2))
		161 (Alluvium bores: JMR23WA, JMR4WA, and JMR25WA)
Petroleum Hydrocarbons		
TPH C6-C9	(µg/L)	20
TPH C10-C36	(µg/L)	50

5.1.2. Groundwater quality assessment

Water quality sampling during 2024 has been undertaken at a quarterly frequency for the bores and sampling parameters shown in Table 5-1 and Table 5-2.

Alluvium bore JMR22WA has been dry since December 2018, JMR24WA has been dry since October 2018 and JMR26WA has been dry since November 2018. These monitoring bores have been observed to be dry during the entire reporting period. JMR25WA was dry for all monitoring rounds during the reporting period and no sample was obtained for water quality analysis. Bores JP0911T and JP0912T monitor the Tertiary alluvium to the south of the Mackenzie River. The bores were monitored from August to October 2023 with access during the reporting period impeded due to rainfall and poor access conditions. Access issues were also encountered during the reporting period at bores JMR22WP, JN1119E and JMR24WP2.

All available water quality data (i.e. pH, electrical conductivity, major ions, metals/metalloids, total petroleum hydrocarbons) are provided in the summary table that is included as Appendix A.

5.1.3. pH

Available pH data is shown in Figure 5-1 for the compliance bores with comparison to the pH groundwater quality limits of 6.37 to 8.6. This shows all data values for the compliance monitoring bores are within the pH quality limits.

- JMR4WA (alluvium) field pH values range from 6.37 to 7.26, with a mean of 6.59 (20 samples). All available samples are within the pH quality limits.
- JMR25WA (alluvium) field pH values range from 6.44 to 6.78, with a mean of 6.57 (12 samples). All available samples are within the pH quality limits.
- JMR4WP2 (Pollux Seam) field pH values range from 6.62 to 7.34, with a mean of 7.18 (11 samples). All available samples are within the pH quality limits.
- JMR24WP2 (Pollux Seam) – the field EC values range from 6.79 to 7.80, with a mean of 7.32 (14 samples). All available samples are within the pH quality limits.

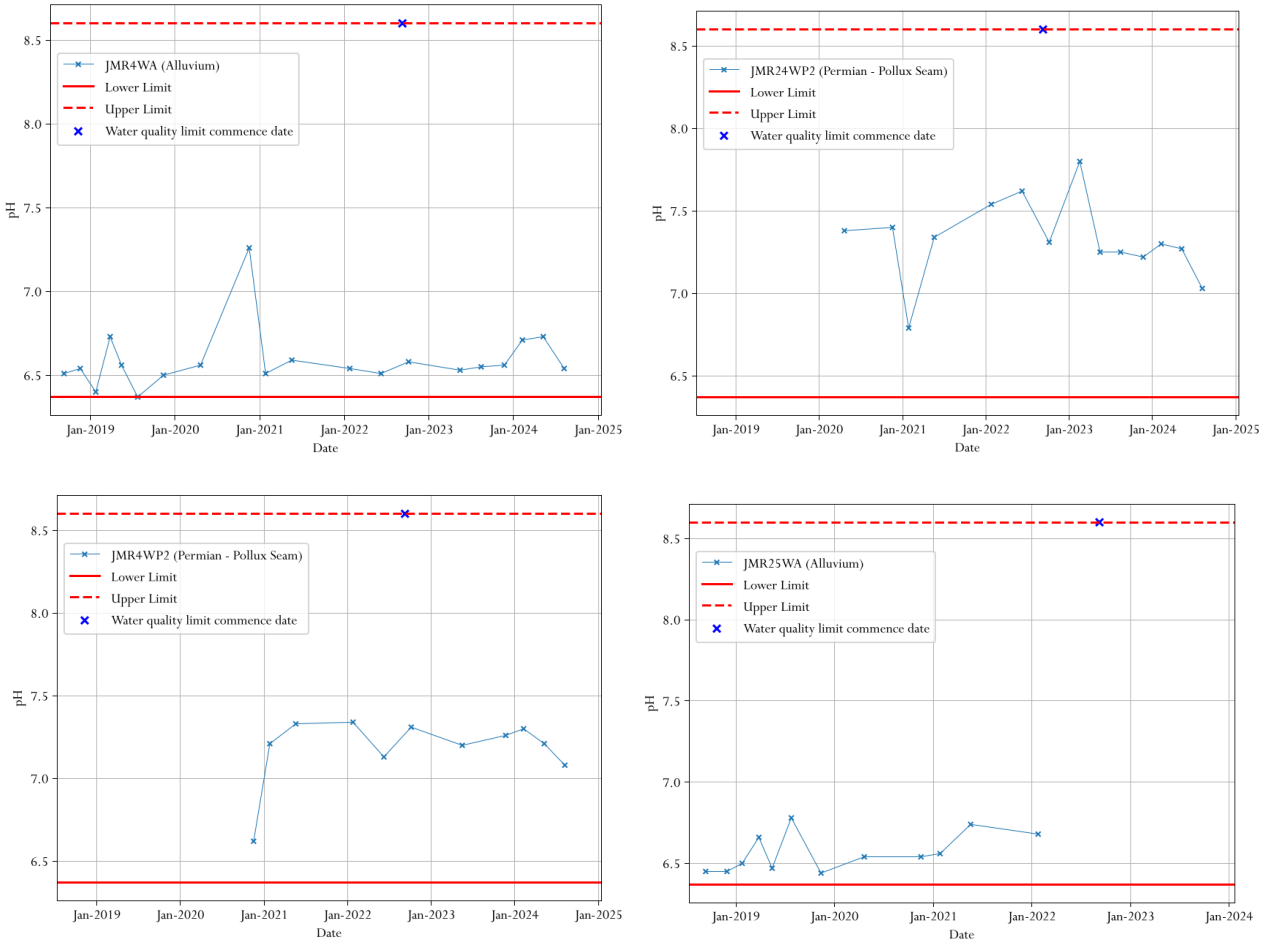

JMR4WA (Alluvium)
Lower Limit
Upper Limit
Water quality limit commence date
pH
Date
JMR24WP2 (Permian - Pollux Seam)
JMR4WP2 (Permian - Pollux Seam)
JMR25WA (Alluvium)

Figure 5-1 pH

5.1.4. Electrical conductivity

Available field electrical conductivity (EC) data is shown in Figure 5-2 for the compliance bores with comparison to the EC groundwater quality limits. EC data for the compliance monitoring bores is summarised as follows:

- JMR4WA (alluvium) field EC values range from 3986 µS/cm to 7,189 µS/cm, with a mean of 5,662 µS/cm (20 samples). All available samples (with the exception of the first sample in September 2018) are below the EA compliance limit of 6,900 µS/cm.
- JMR25WA (alluvium) the field EC values range from 1,171 µS/cm to 2,358 µS/cm, with a mean of 1,574 µS/cm (12 samples). All samples are below the EA compliance limit of 2,200 µS/cm with the exception of the sample in May 2021. JMR25WA was dry for all monitoring rounds during the reporting period.
- JMR4WP2 (Pollux Seam) the field EC values range from 3,448 µS/cm to 9,883 µS/cm, with a mean of 5,811 µS/cm (11 samples). All available samples are below the EA compliance limit of 9,590 µS/cm.
- JMR24WP2 (Pollux Seam) – the field EC values range from 6,912 µS/cm to 8,587 µS/cm, with a mean of 7,472 µS/cm (13 samples). A single EC value of 11,491 µS/cm for JMR24WP2 in January 2021 was excluded from the statistical analysis in previous reporting as an outlier. Apart from the single value of 11,491 µS/cm, all samples have been below the EA compliance limit of 10,490 µS/cm.

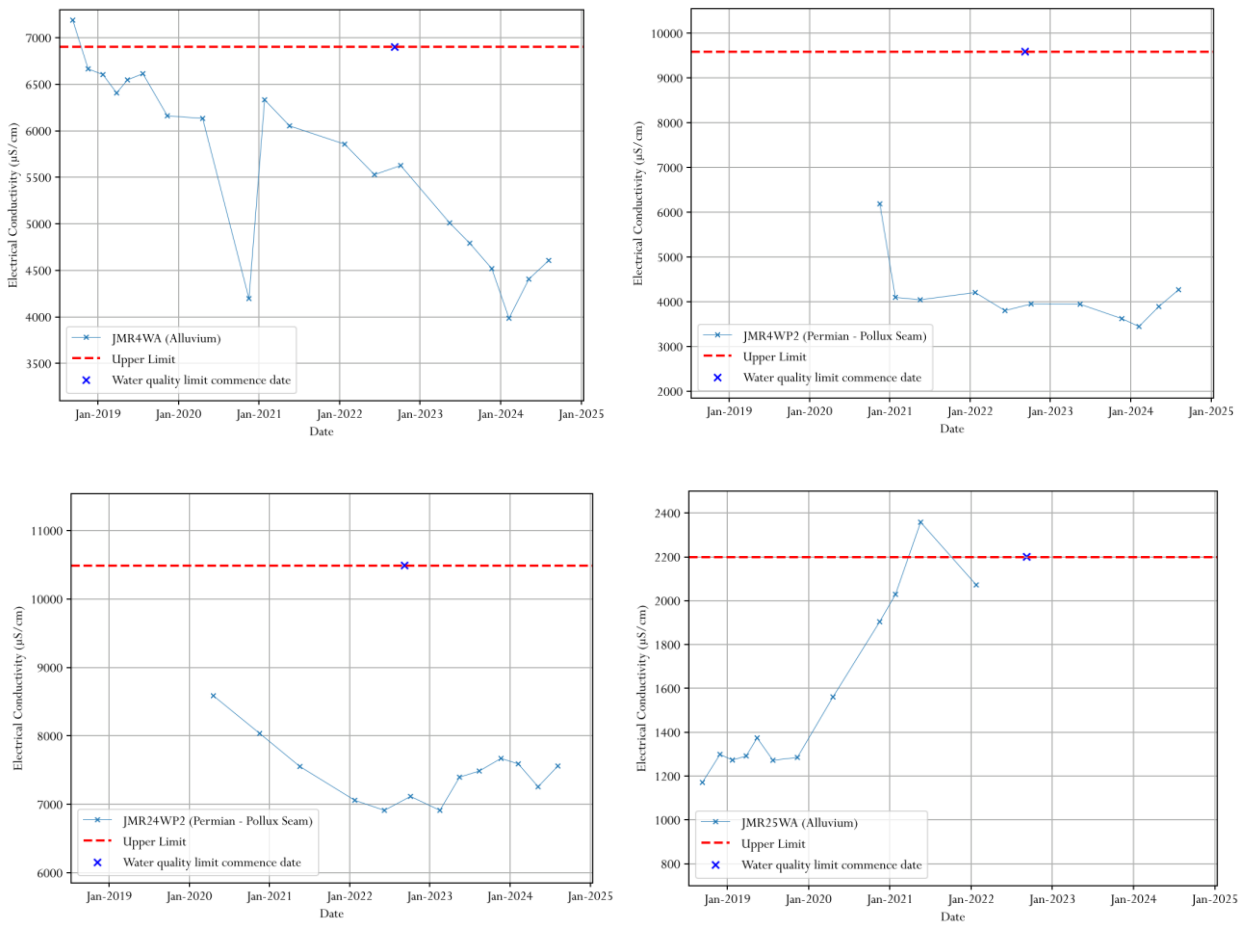


Figure 5-2 Electrical conductivity

5.1.5. Sulfate

Available sulfate data is shown in Figure 5-3 for the compliance bores with comparison to the sulfate groundwater quality limits. Sulfate data for the compliance monitoring bores is summarised as follows:

- JMR4WA (alluvium) sulfate values range from 64 mg/L to 105 mg/L, with a mean of 85 mg/L (21 samples). All samples are below the EA compliance limit of 103 mg/L with the exception of the sample in July 2019.
- JMR25WA (alluvium) sulfate values range from 2 mg/L to 17 mg/L, with a mean of 10 mg/L (12 samples). Historically, only one out of twelve samples have been above the EA sulfate compliance limit of 16 mg/L. JMR25WA was dry for all monitoring rounds during the reporting period.
- JMR4WP2 (Pollux Seam) sulfate values range from 35 mg/L to 98 mg/L, with a mean of 52 mg/L (11 samples). All samples except for the first two are below the EA sulfate compliance limit of 60 mg/L.
- JMR24WP2 (Pollux Seam) sulfate values range from <1 mg/L to 6 mg/L, with seven out of 13 samples recording a sulfate value below the limit of reporting (i.e. LOR < 1 mg/L). A single value of 404 mg/L from January 2021 is currently assessed as an outlier and is not considered further in the analysis. All samples have been below the EA compliance limit of 20 mg/L.

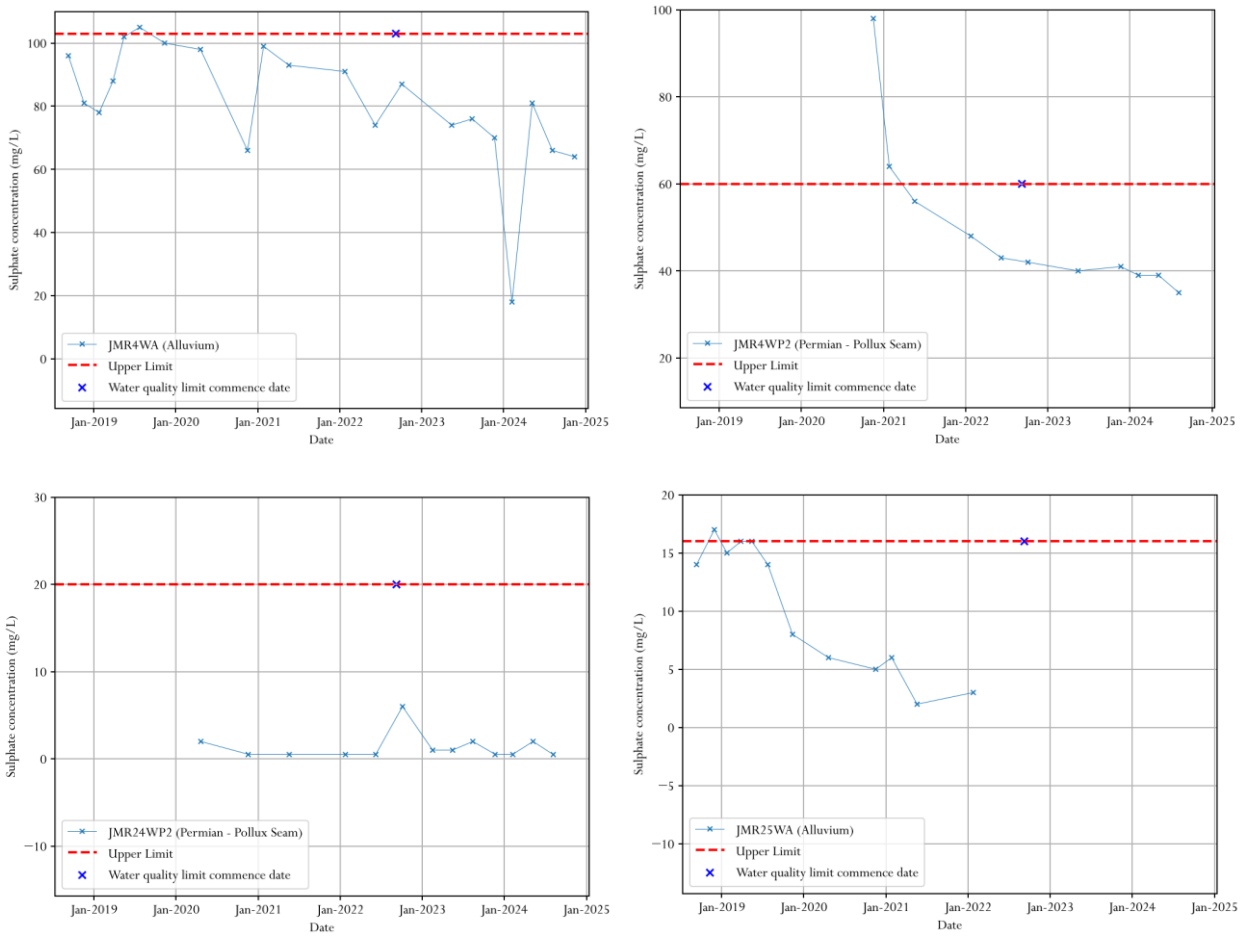


Figure 5-3 Sulfate

5.1.6. Metals

Available metal/metalloid data for the compliance monitoring bores are shown in Figure 5-4 to Figure 5-12. For each figure shows the relevant EA contaminant limit (Table 5-2) for reference (noting that the EA commencement data for assessment of contaminant limits is 8 September 2022).

For each figure, a concentration value that is below the LOR, does not show a symbol on the figure. Isolated values that are greater than the LOR are shown as single data points, with values that are greater than the LOR for consecutive data points being connected by lines between the data symbols. With respect to available metal/metalloid data the following observations are made:

- Figure 5-4 shows most samples are below the LOR for dissolved aluminium, except for JMR22WP (Pollux Seam). JMR22WP had historical values below the contaminant limit of 0.055 mg/L. JMR22WP recorded three values in 2024 that exceeded the groundwater contaminant limit with 0.14 mg/L in February, 0.14 mg/L in May and 0.12 mg/L in September.
- Figure 5-5 shows all dissolved arsenic values are below the contaminant limit of 0.013 mg/L for the 2024 reporting period.
- Figure 5-6 shows most dissolved chromium values are below the LOR, with isolated values recorded above the contaminant limit of 0.001 mg/L. The exception being JMR22WP and JMR4WP2. JMR4WP2 recorded a single groundwater contaminant limit value of 0.001 mg/L in February. JMR22WP recorded three consecutive values in 2024 that exceeded the groundwater contaminant limit of 0.058 mg/L in February, 0.054 mg/L in May and 0.046 mg/L in September.
- Figure 5-7 shows most dissolved copper values are below the LOR, with isolated values recorded above the contaminant limit of 0.002 mg/L. In 2024 JMR22WP and JMR4WA had values above the contaminant limit. JMR22WP had three consecutive measurements in 2024 that exceeded the groundwater contaminant limit value at 0.008 mg/L in February, 0.007 mg/L in May and 0.005 mg/L in September. JMR4WA recorded two consecutive measurements in 2024 that exceeded the groundwater contaminant limit value with 0.003 mg/L in August and 0.003 mg/L in November.
- Figure 5-8 shows all dissolved manganese values are below the contaminant limit of 1.9 mg/L for the 2024 reporting period.
- Figure 5-9 shows most dissolved molybdenum values are below the contaminant limit of 0.034 mg/L. The exception being JMR22WP and JN1119E. JMR22WP recorded three consecutive measurements in 2024 that exceeded the groundwater contaminant limit value at 0.081mg/L in February, 0.077 mg/L in May and 0.079 mg/L in September. JN1119E recorded three consecutive measurements in 2024 that exceeded the groundwater contaminant limit value with 0.054 mg/L in February, 0.051 mg/L in May and 0.054 mg/L in September. The field pH for JN1119E is regularly greater than 11 which is indicative of potential grout contamination from possible bore construction issues. The water chemistry of JMR22WP (which JN1119E was originally intended to replace) is considered to be a reliable indicator of groundwater quality in the vicinity of where the bores are located.
- Figure 5-10 shows all bores recorded dissolved nickel values below the groundwater contaminant limit historically and for the 2024 reporting period.
- Figure 5-11 shows all bores recorded dissolve selenium values below the LOR and groundwater contaminant limit historically and for the 2024 reporting period.
- Figure 5-12 shows all bores recorded dissolved zinc values below the groundwater contaminant limit historically and for the 2024 reporting period.

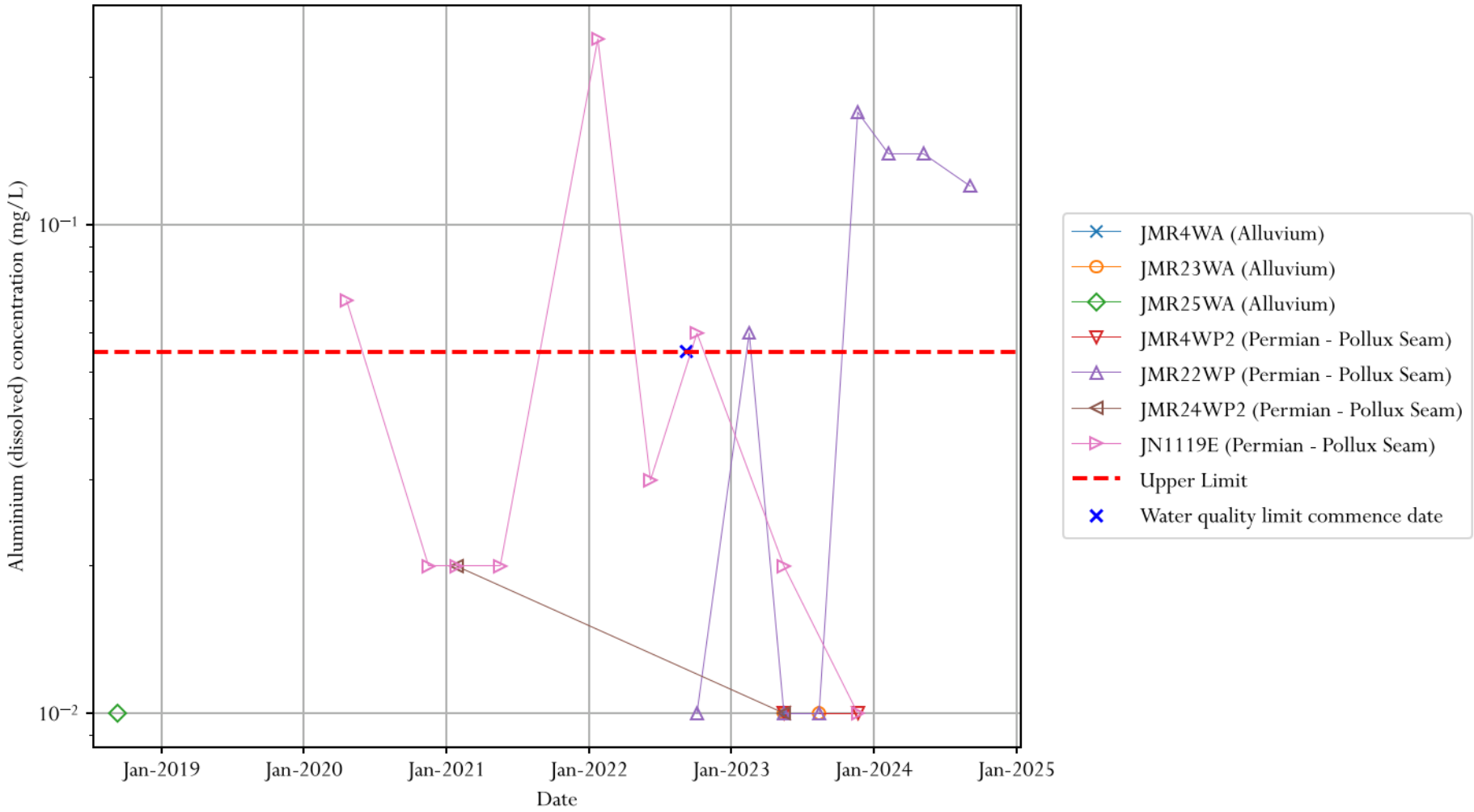


Figure 5-4 Dissolved aluminium

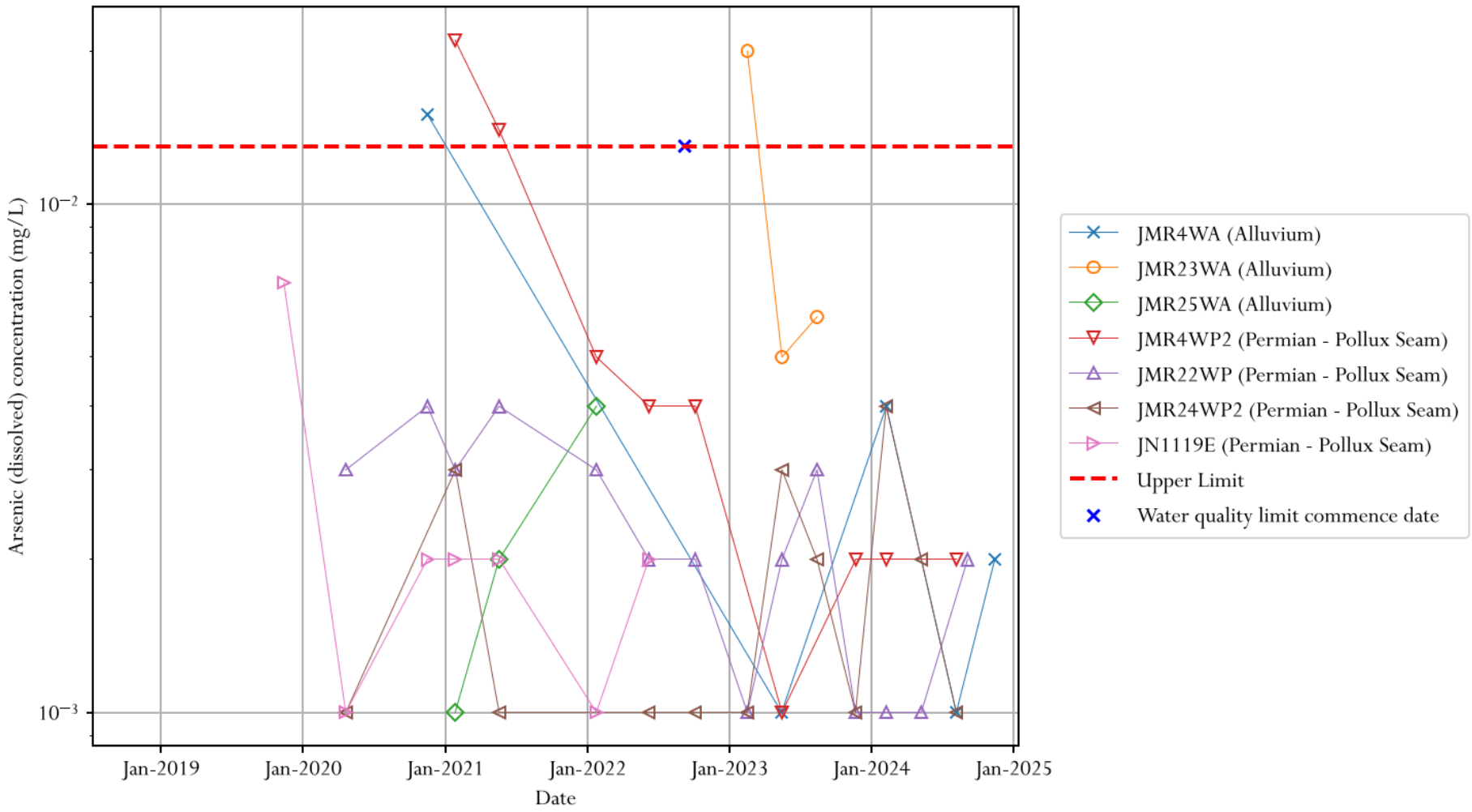


Figure 5-5 Dissolved arsenic

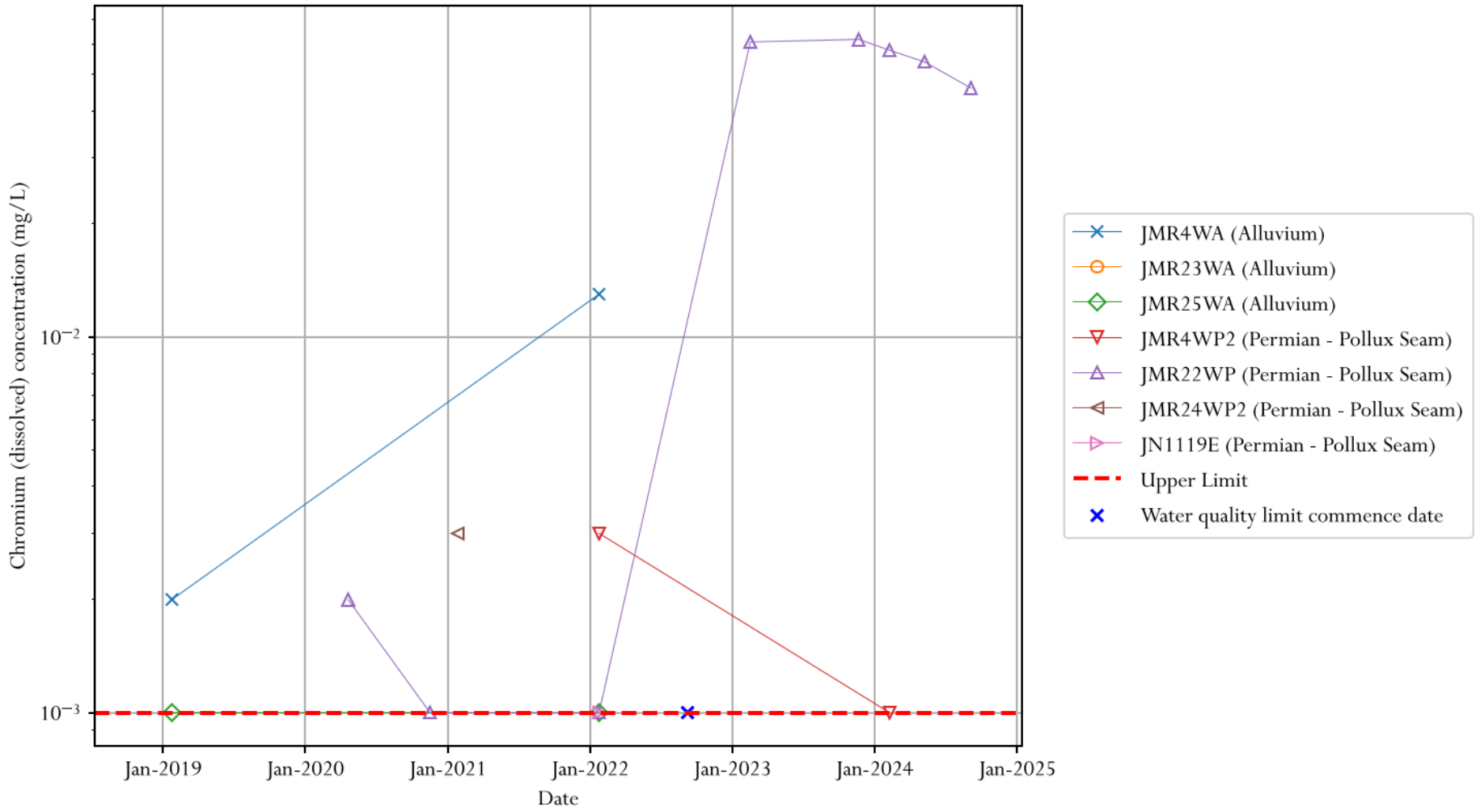


Figure 5-6 Dissolved chromium

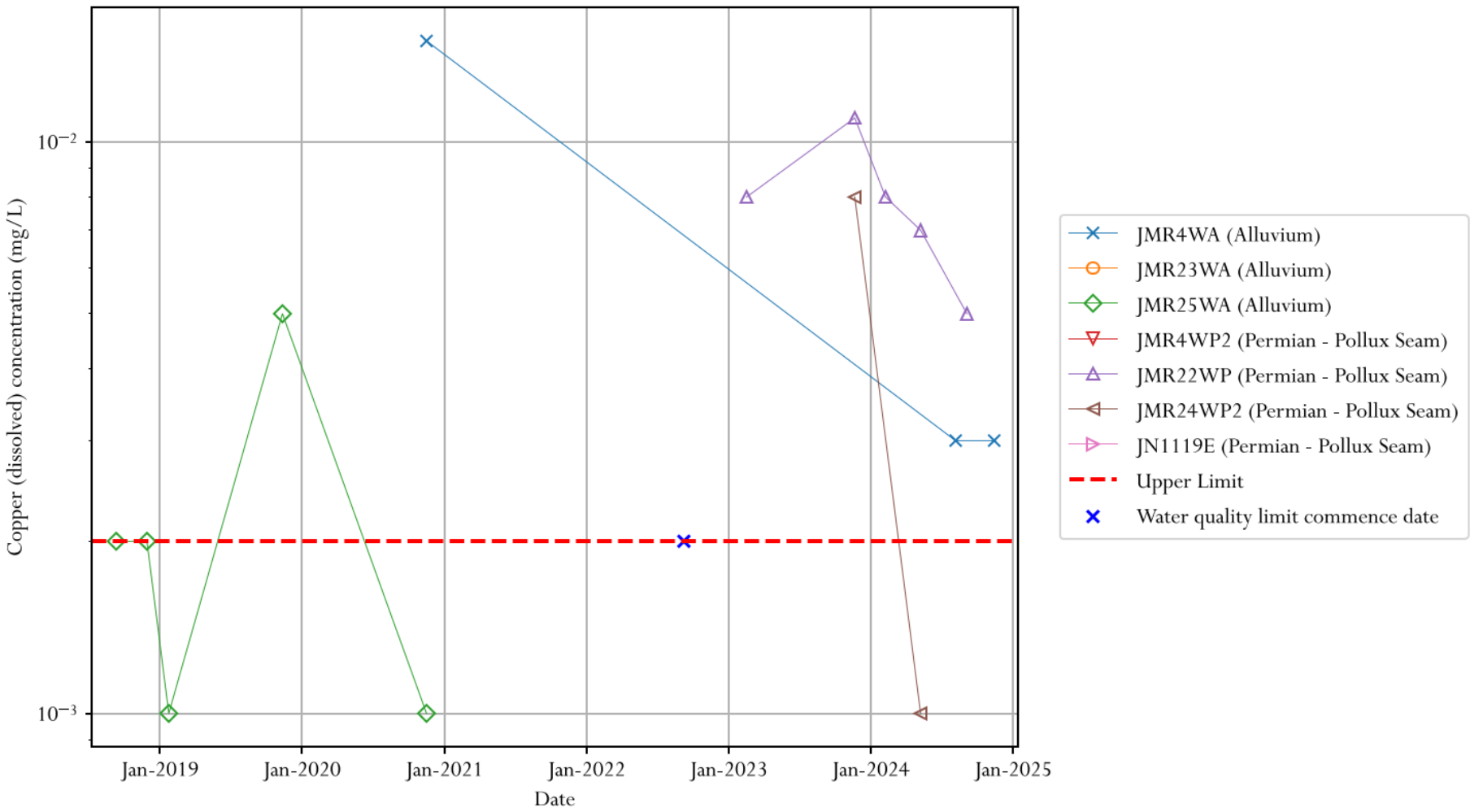


Figure 5-7 Dissolved copper

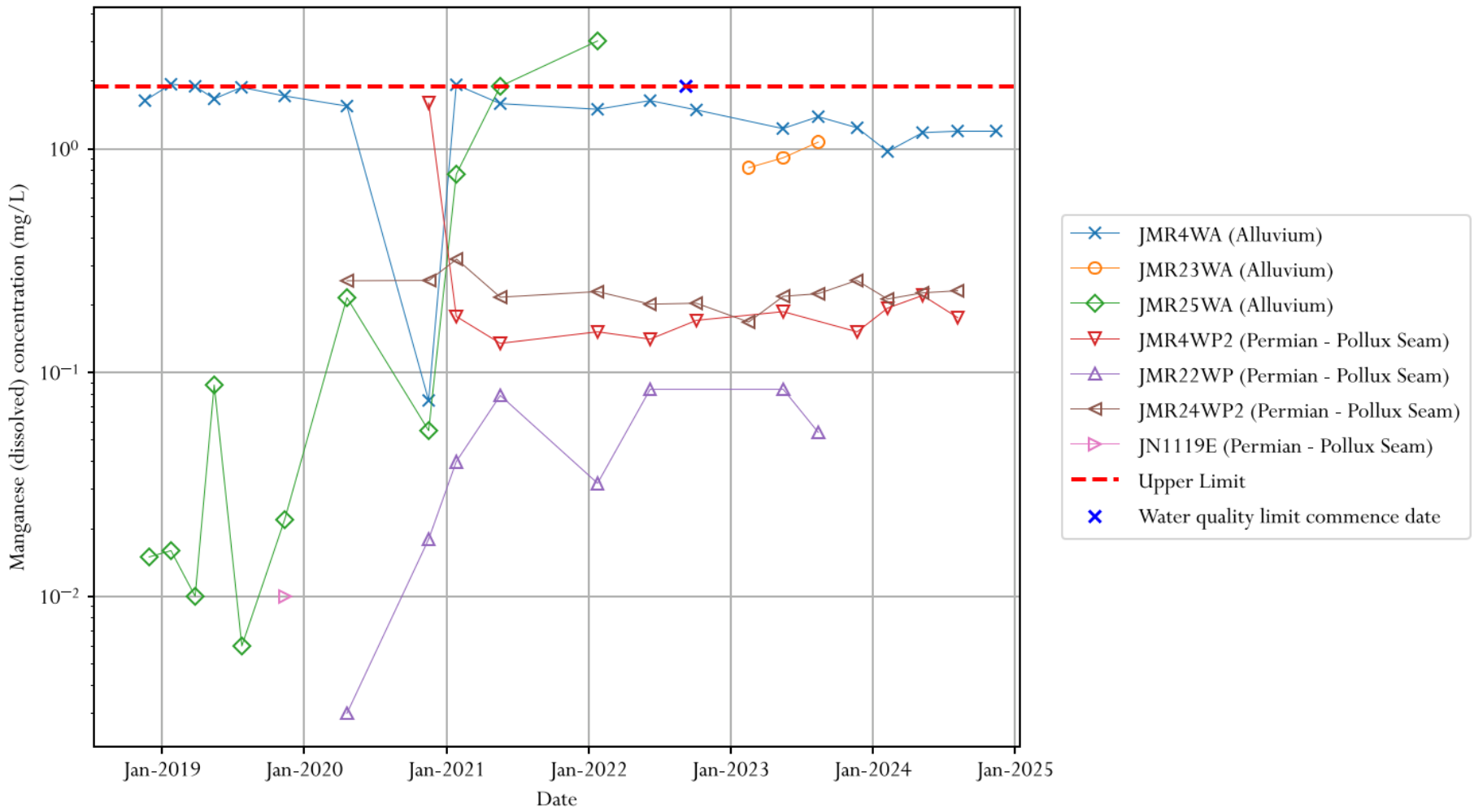


Figure 5-8 Dissolved manganese

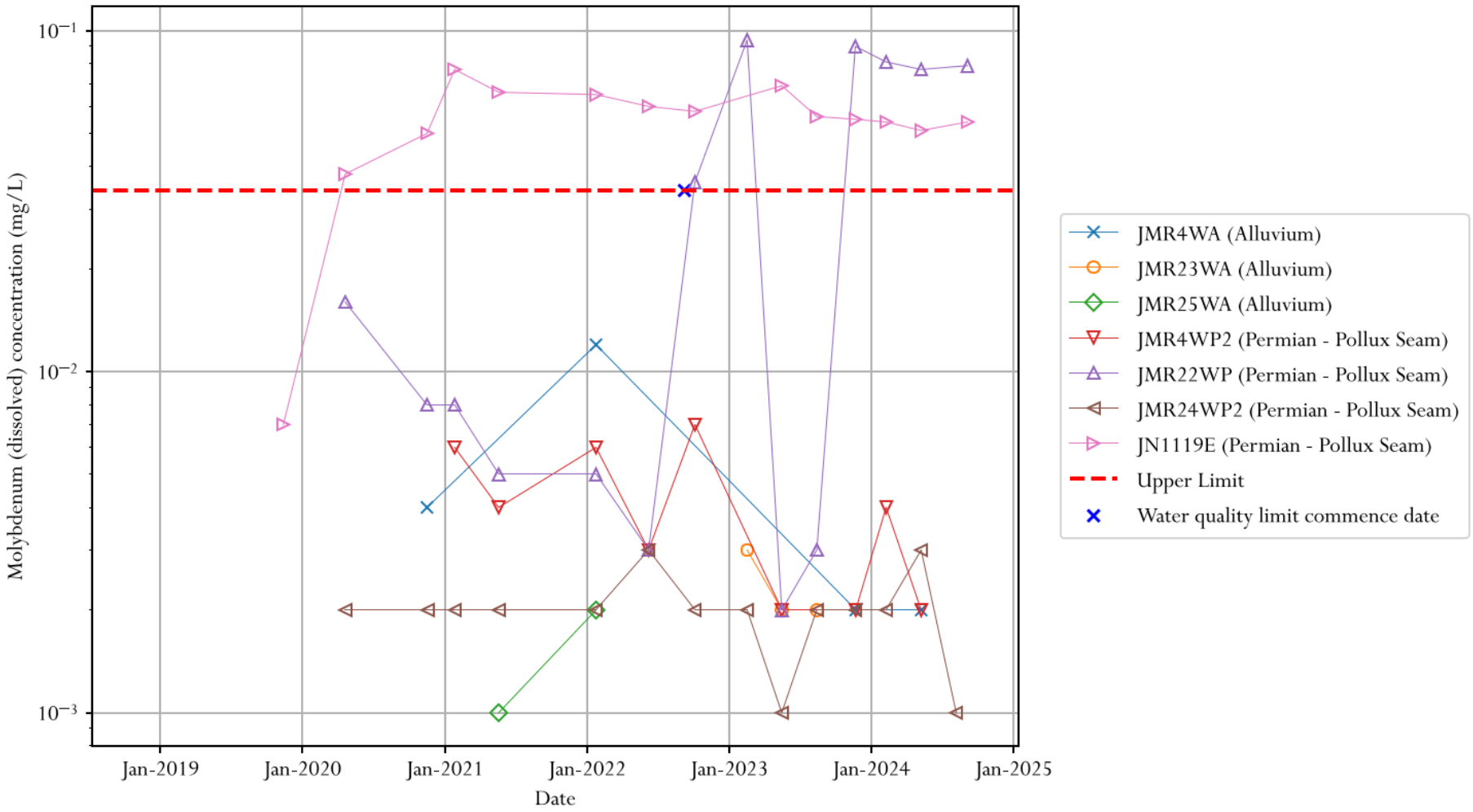


Figure 5-9 Dissolved molybdenum

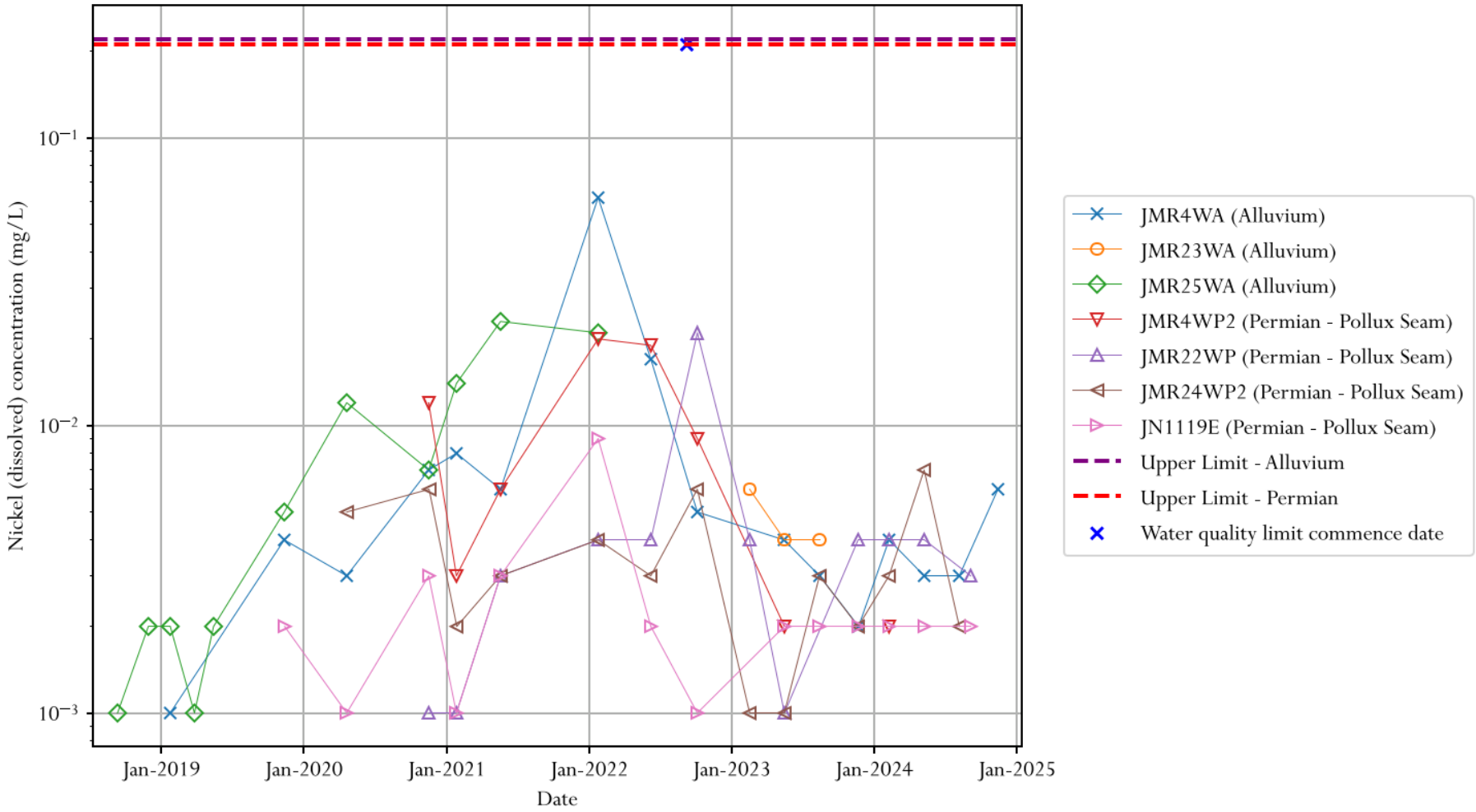


Figure 5-10 Dissolved nickel

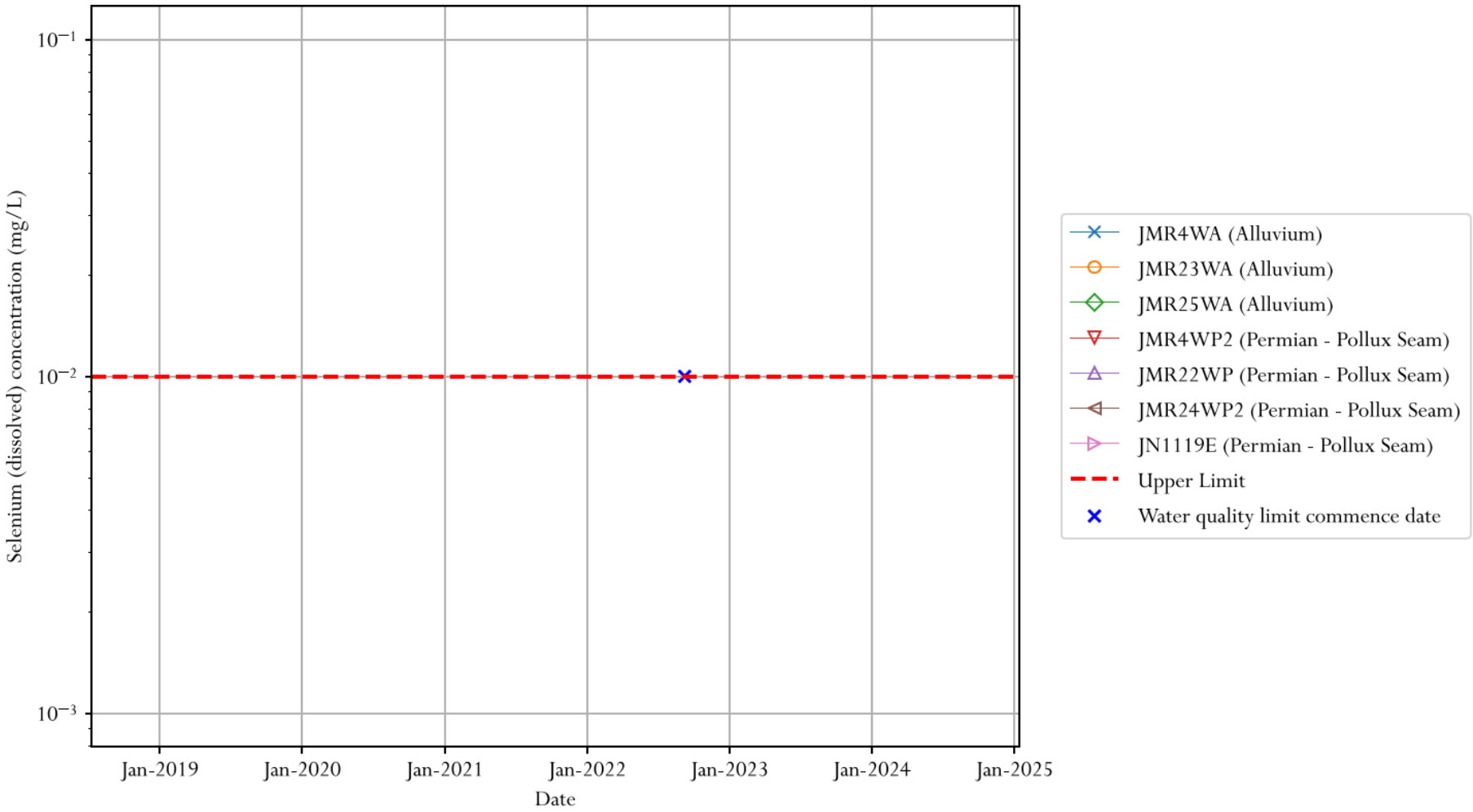


Figure 5-11 Dissolved selenium

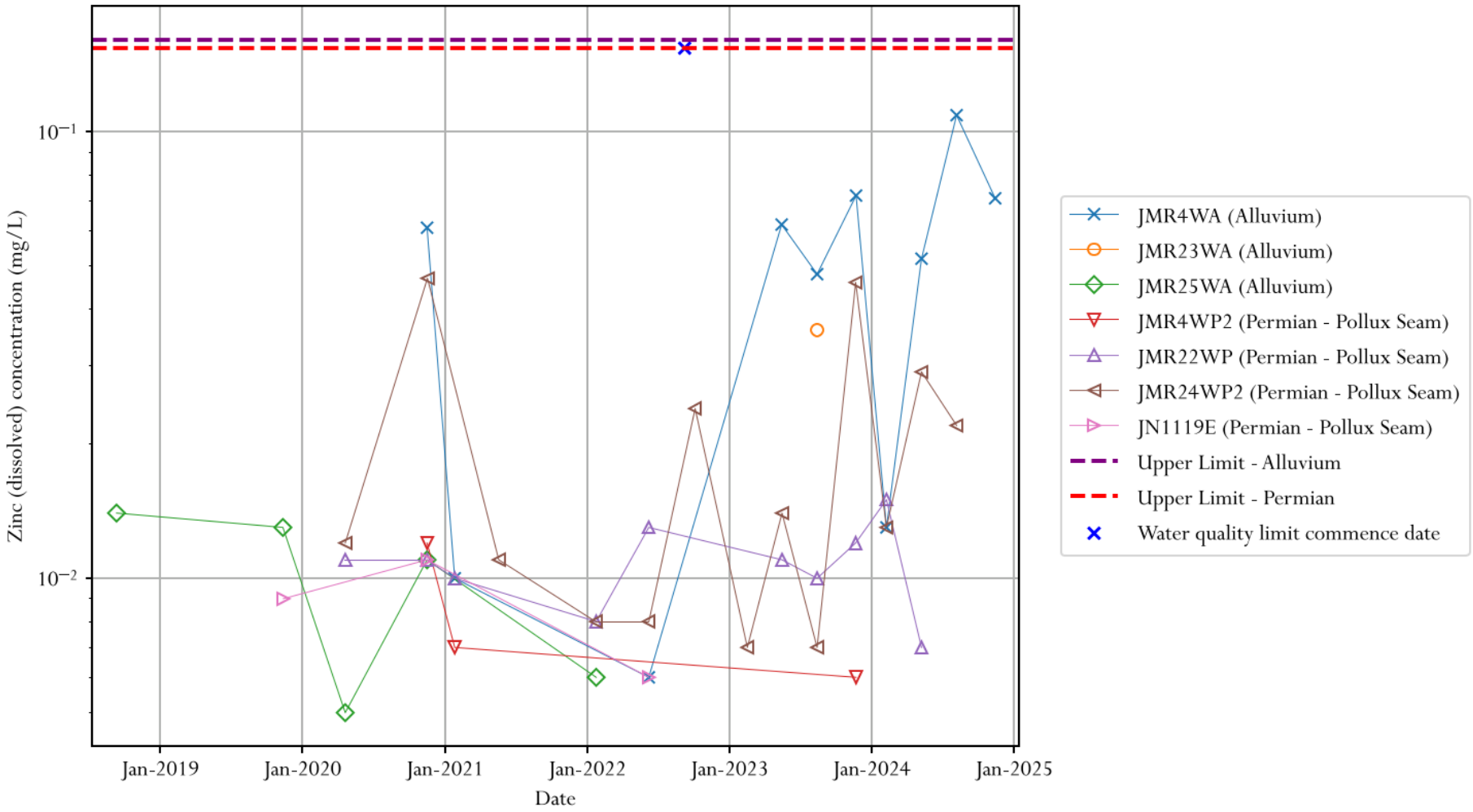


Figure 5-12 Dissolved zinc

5.1.7. Total Petroleum Hydrocarbon (TPH)

Available Total petroleum hydrocarbon (TPH) data for the compliance monitoring bores are shown in Figure 5-13 to Figure 5-14. For each figure shows the relevant EA contaminant limit (Table 5-2) for reference (noting that the EA commencement data for assessment of contaminant limits is 8 September 2022).

For each figure, a concentration value that is below the LOR, does not show a symbol on the figure. Isolated values that are greater than the LOR are shown as single data points, with values that are greater than the LOR for consecutive data points being connected by lines between the data symbols. With respect to available TPH data the following observations are made:

- Figure 5-13 shows the TPH C6-C9 fraction data relative to the groundwater contaminant limit of 20 µg/L or 0.020 mg/L (which is also the LOR for this parameter). Apart from isolated historic values above the LOR (and therefore above the contaminant limit), there have been no occurrences of consecutive values above the LOR for this parameter for the 2024 reporting period.
- Figure 5-14 shows the TPH C10-C36 fraction data relative to the groundwater contaminant limit of 50 µg/L or 0.050 mg/L (which is also the LOR for this parameter). Most bores had TPH C10-C36 fraction values below the LOR for the 2024 reporting period. The exception being:
    - JMR4WA recorded a single value in 2024 that exceeded the groundwater contaminant limit value of 0.07 mg/L in November;
    - JMR22WP recorded three consecutive measurements in 2024 that exceeded the groundwater contaminant limit value of 0.39 mg/L in February, 0.31 mg/L in May and 0.19 mg/L in September; and
    - JN1119E recorded two consecutive measurements in 2024 that exceeded the groundwater contaminant limit value of 0.080 mg/L in May and 0.050 mg/L in September.

All bores show a decreasing trend in TPH C10-C36 fraction data over the 2024 reporting period. TPH samples have previously been tested via the silica gel cleanup method to establish whether the hydrocarbons are biogenic (naturally occurring) and therefore not indicative of contamination due to site activities. This has confirmed that the majority of the TPH concentrations observed from the bores are due to organic compounds.

These results are consistent with the previous conclusions that the presence of hydrocarbon contamination in groundwater is not suspected as the high concentrations existed prior to mining activities. The silica gel cleanup method should be routinely carried out as part of the compliance sampling to confirm this assessment and minimise any exceedances of the contaminant limit.

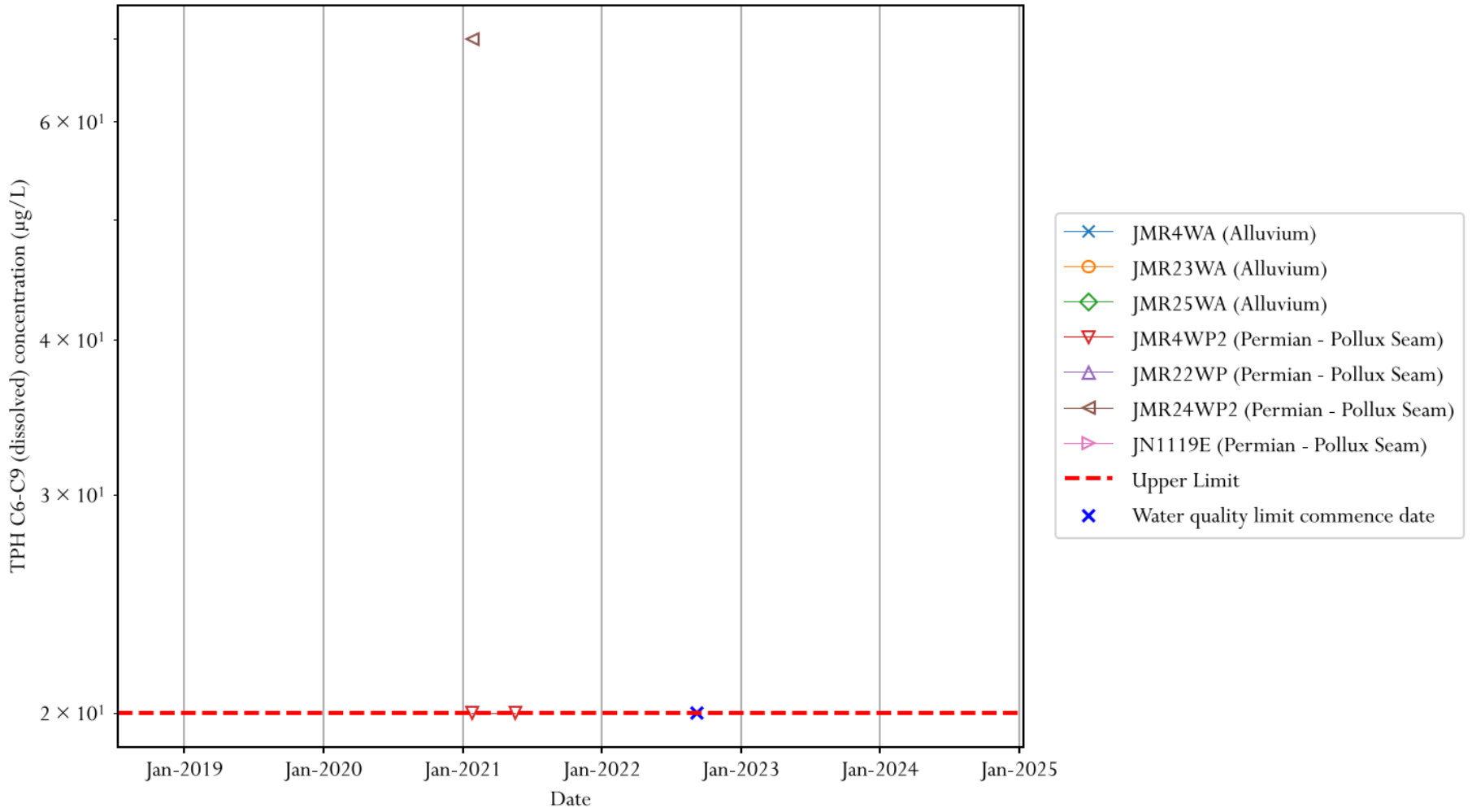


Figure 5-13 TPH C6-C9 fraction

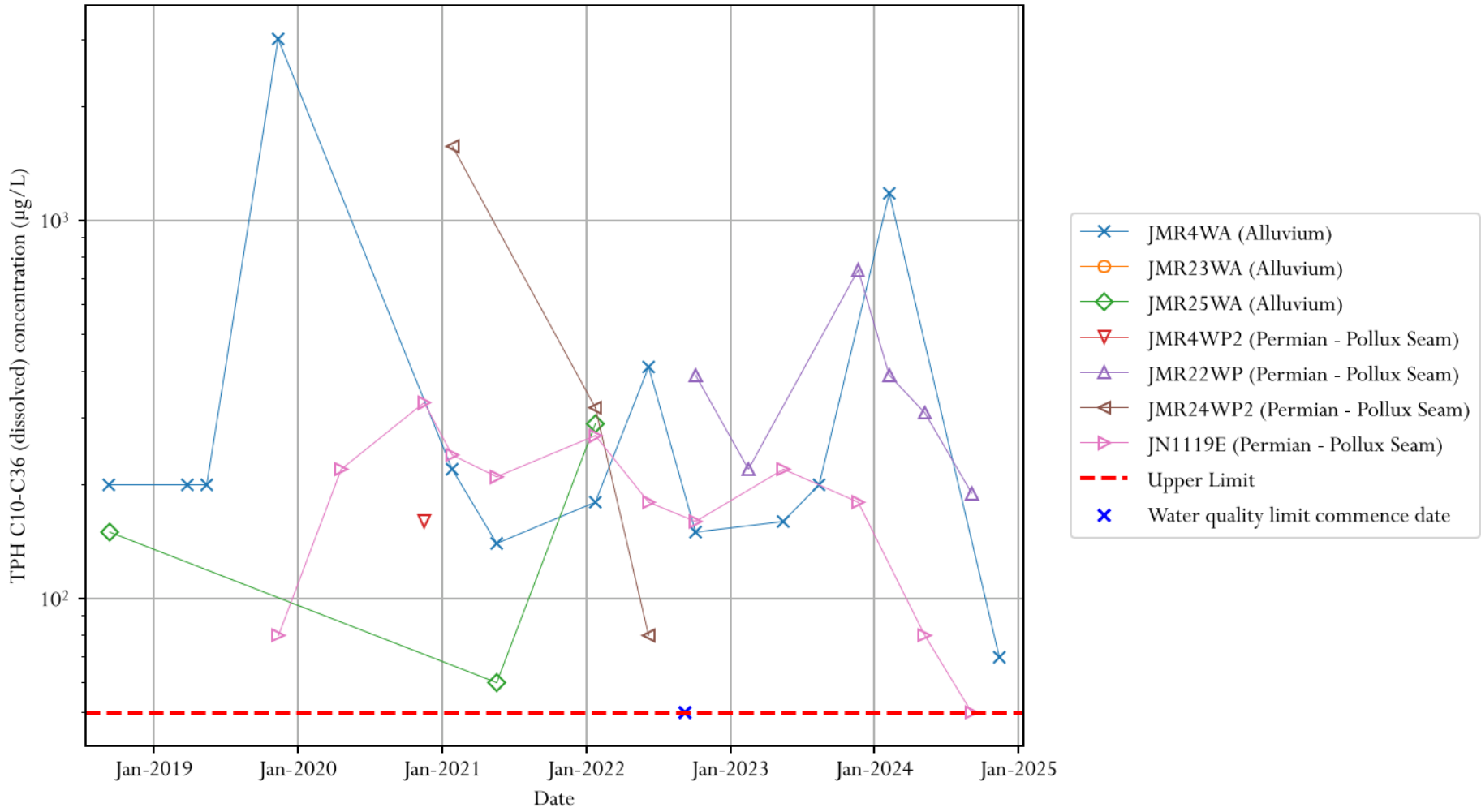


Figure 5-14 TPH C10-C36 fraction

5.2. Groundwater level monitoring

5.2.1. Monitoring requirements

Groundwater level monitoring is undertaken at all sites on a quarterly basis. Data loggers are fitted to three of the Quaternary alluvium monitoring bores (JMR4WA, JMR23WA and JMR25WA), which are located between the mining operation and the Mackenzie River. The logger data is analysed to establish seasonal variations in water levels, including response to rainfall recharge and response to flow events in the Mackenzie River.

5.2.2. Assessment of groundwater level data

This section presents the following tables and figures:

- Table 5-3 shows the EA groundwater level monitoring locations, the required monitoring frequency and the groundwater drawdown triggers for each bore (based on Table I4 of the EA);
- Table 5-4 shows the observed groundwater level drawdown (the most recent 2024 reading) relative to the baseline value for each monitoring site;
- Figure 5-15 shows the hydrographs (groundwater elevation over time) for each monitoring site;
- Figure 5-16 shows datalogger and manual water level data for alluvium bore JMR4WA;
- Figure 5-17 shows datalogger and manual water level data for alluvium bore JMR23WA;
- Figure 5-18 shows datalogger and manual water level data for alluvium bore JMR25WA;
- Figure 5-19 shows ground elevation for the mining area in December 2024;
- Figure 5-20 shows the average 2024 groundwater level for bores that are closest to the mining area relative to pre-mining (Dec 2012) groundwater level; and
- Available groundwater level data is included in Appendix B.

Based on review of available groundwater level data, the following observations are made with respect to bores that monitor the alluvium:

- The alluvium bores have declined in water levels likely in response to reduced or below average rainfall conditions from 2018 to 2021. Above average rainfall from 2021 to 2022 resulted in higher groundwater recharge and rising groundwater levels are evident in some monitoring bores. Groundwater levels recorded over the reporting period reflect the recent rainfall conditions (Figure 5-15).
- JMR22WA has been dry since December 2018, JMR24WA has been dry since October 2018 and JMR26WA has been dry since November 2018.
- Bores JP0911T and JP0912T monitor the Tertiary alluvium to the south of the Mackenzie River. The bores were monitored from August to October 2023 with access in 2024 impeded due to rainfall and poor access conditions.
- Figure 5-16 shows the logger data for JMR4WA, which has been collected at six hourly intervals since November 2020. The groundwater level recorded over the 2024 year are stable ranging between 22.20 mbgl to 22.40 mbgl.
- Figure 5-17 shows the logger data for JMR23WA. Groundwater levels were recorded above the base of bore since June 2022. However, the data was assessed as being unreliable prior to January 2023 (JBT, 2023) [3]. The groundwater level recorded over the 2024 year are slightly declining ranging between 19.92 mbgl to 20.11 mbgl.
- Figure 5-18 shows the logger data for JMR25WA. Since June 2022, the groundwater level was just above the bore base or dry. Over the reporting period the bore was dry.

[3] JBT, 2023. Jellinbah Mine, Mackenzie North, Annual Groundwater Monitoring Report 2022 – 2023 Water Year. Final, 29 September 2023.

Based on review of available groundwater level data, the following observations are made with respect to bores that monitor the Permian coal measures:

- The Permian overburden bores JMR24WP2 have a degree of hydraulic isolation from the coal seams (JBT, 2023). Groundwater levels have increased in these bores since May 2023. The groundwater elevation recorded over the 2024 year ranged between 82.46 mAHD to 79.61 mAHD (Figure 5-15).
- The Permian bore JN1119E is located approximately 800 metres from the mining area. The bore has previously been reported to be within the zone of predicted groundwater level impact from mining (JBT, 2023). Over the reporting period groundwater levels are stable (Figure 5-15).
- The Permian bore JMR4WP2 groundwater level are stable over the 2024 year. The data shows no response to mining activities and unlikely to be impacted by mining (Figure 5-15).

Table 5-4 shows the observed groundwater level drawdown in 2024 relative to the baseline level, as well as the remaining drawdown at each bore until the drawdown level trigger threshold is reached. With respect to impact of mining activities (and with reference to EA Table I4 and Table 5-4 of this report), it is concluded there are no groundwater level trigger exceedances for the specific groundwater bores. Groundwater levels for bores JN1119E and JMR22WP have decreased since October 2022, however the drawdown is not considered significant compared to pre-mining groundwater levels.

Bores JMR22WA and JMR24WA are the closest alluvium bores to the mining area. These bores were dry in December 2012, are currently dry, and have been dry for every monitoring event in between. It is therefore concluded that groundwater levels in the alluvium have not been impacted by mining activities.

Table 5-3 Groundwater level monitoring locations, frequency and triggers (Table I4 of EA)

Monitoring bore	Hydrogeological unit	Location (decimal degrees, GDA2020)		Surface RL (mAHD)	Screened interval (mbgl)		Monitoring frequency[1]	Baseline water level[3] (mAHD)	Level trigger threshold - end of mining drawdown[2] (m)
		Latitude	Longitude		From	To			
Interpretation Bores									
JP0911T	Alluvium	-23.264898	148.901783	124.86	22	28	Q	99.48	N/A
JP0912T	Alluvium	-23.262135	148.928424	122.56	36	42	Q	100.89	N/A
JMR26WA	Alluvium	-23.265381	148.921434	123.4	18.2	21.2	Q	Dry	N/A
Compliance Bores									
JMR4WP2	Permian-Pollux seam	-23.25303	148.915413	124	83.5	88	Q	103.2	18
JMR24WP2	Permian-Overburden	-23.208712	148.927998	120.5	72.8	78.8	Q	77.81	55
JMR4WA	Alluvium	-23.253039	148.915384	123.8	36	42	Q	103.25	10 to 20
JMR25WA	Alluvium	-23.249658	148.919381	122.5	17.9	20.9	Q	102.43	5 to 10
JMR22WP	Permian	-23.228966	148.926433	122.2	157	163	Q	101.24	90
JMR22WA	Alluvium	-23.22912	148.926396	122.2	14.5	17.5	Q	Dry	N/A
JN1119E	Permian	-23.225812	148.925928	121.38	140	146	Q	100.79	100
JMR24WA	Alluvium	-23.208712	148.927979	120.4	14.8	17.8	Q	Dry	N/A
JMR23WA	Alluvium	-23.242885	148.9276	122.3	17.2	20.2	Q	Dry	N/A

Notes: 1. Q - quarterly monitoring (every 3 months).

2. Trigger level thresholds sourced from 'Australasian Groundwater & Environmental Consultants Pty Ltd, report on Mackenzie North groundwater assessment, June 2013' (AGE 2013).

3. Baseline water levels are underpinned by data gathered prior to July 2020 (as mining of coal in the Mackenzie North Pit commenced in August 2020).

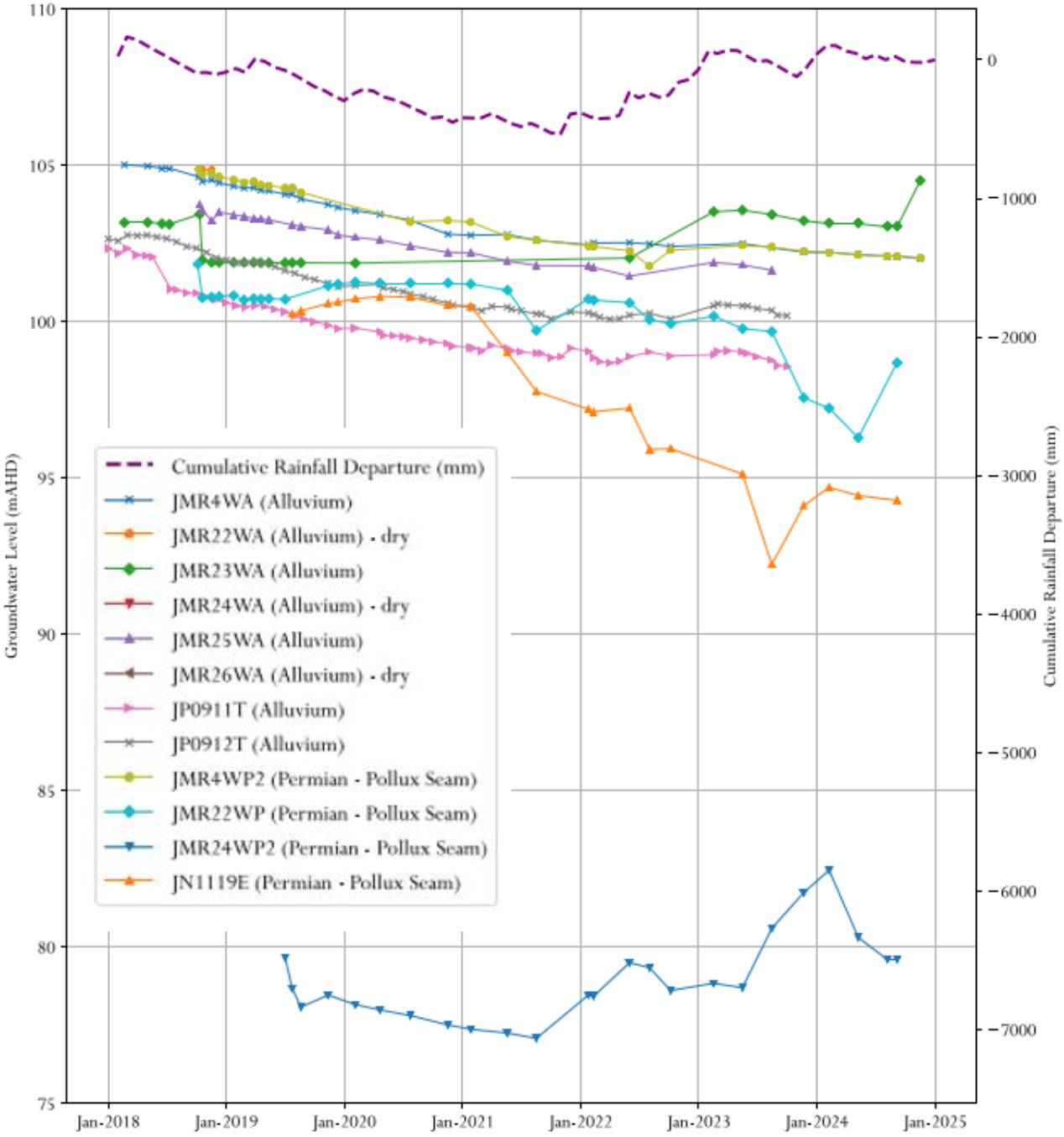


Figure 5-15 Groundwater level hydrographs

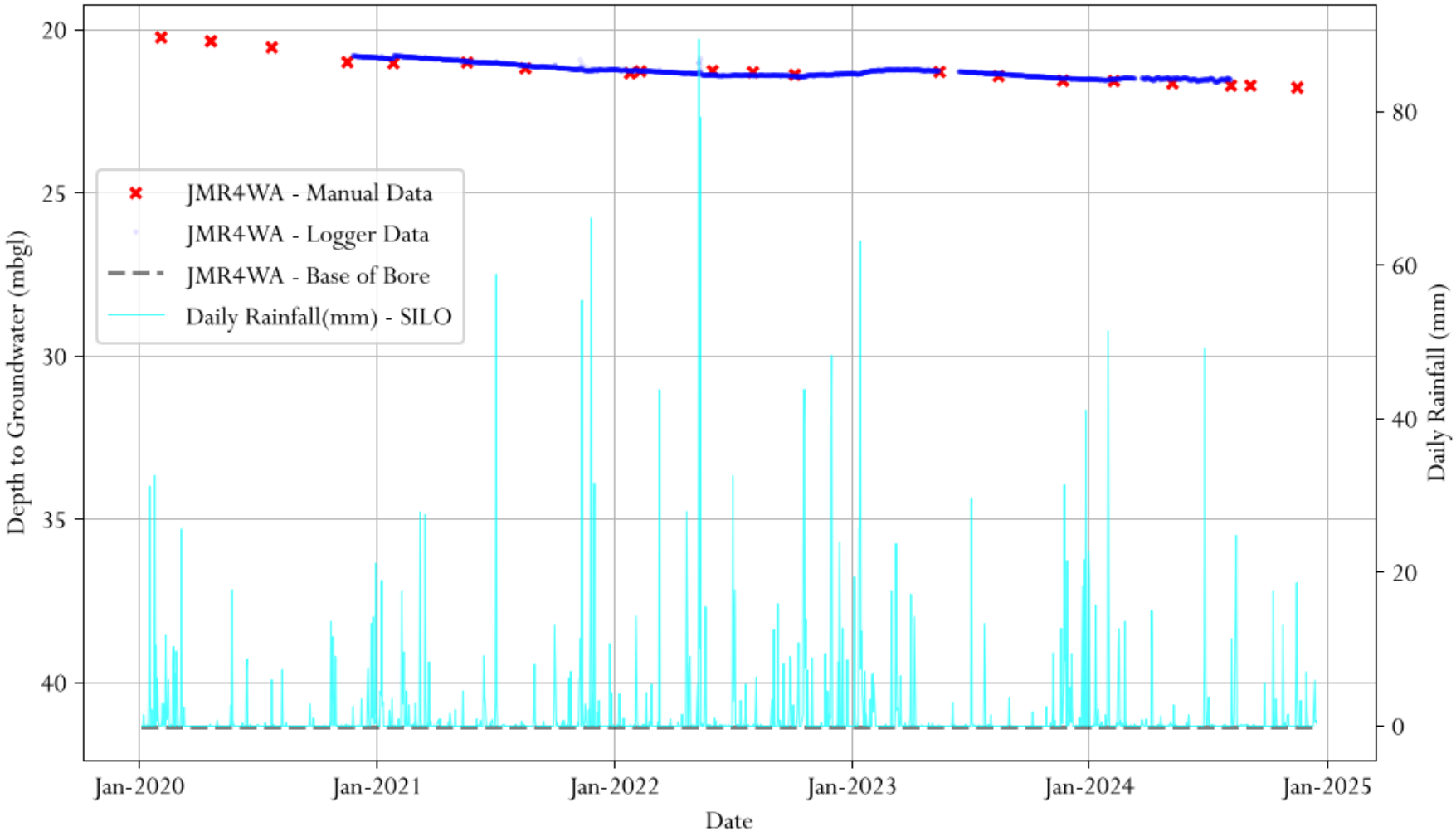


Figure 5-16 Datalogger and manual water level data –JMR4WA

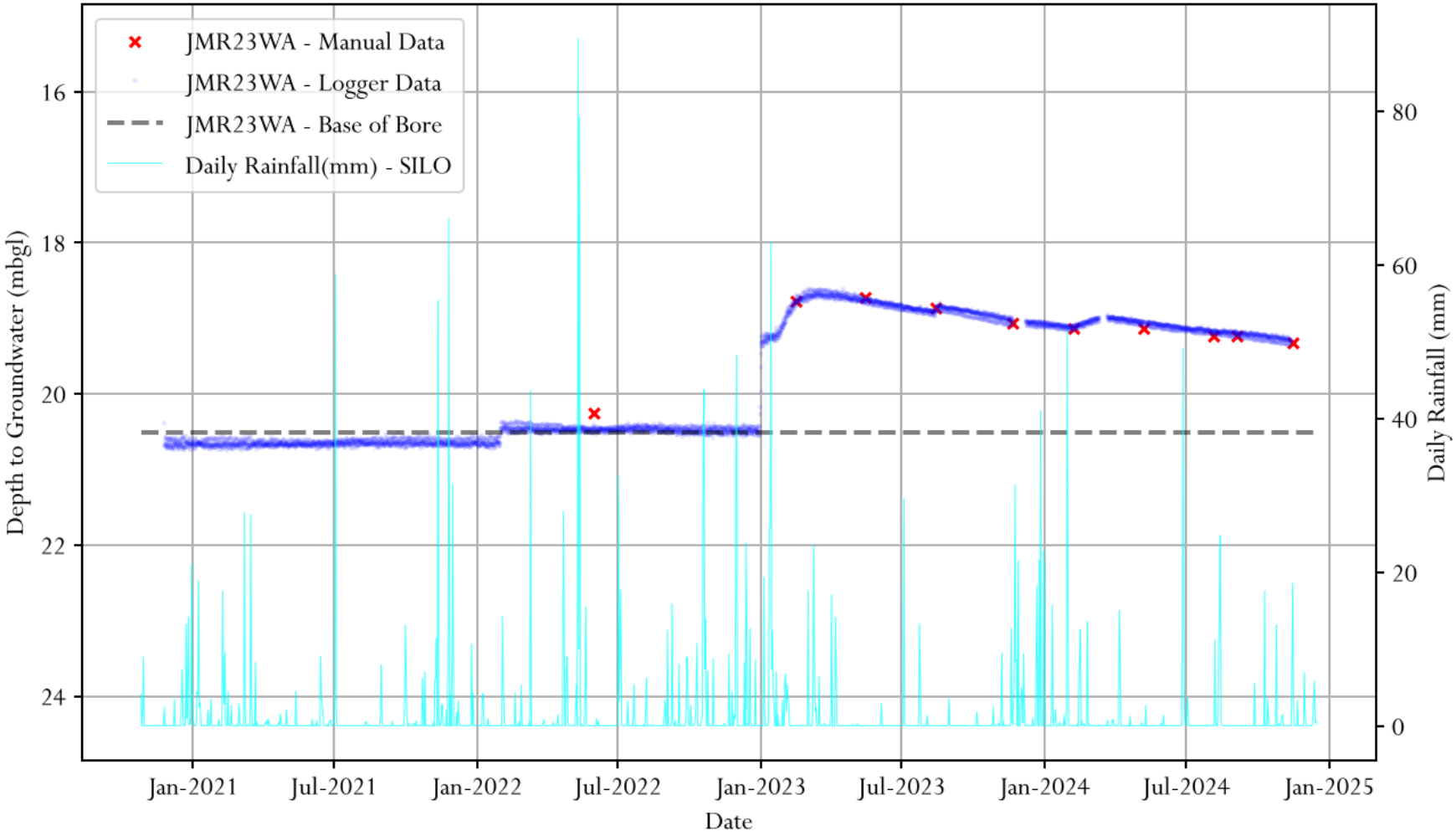


Figure 5-17 Datalogger and manual water level data – JMR23WA

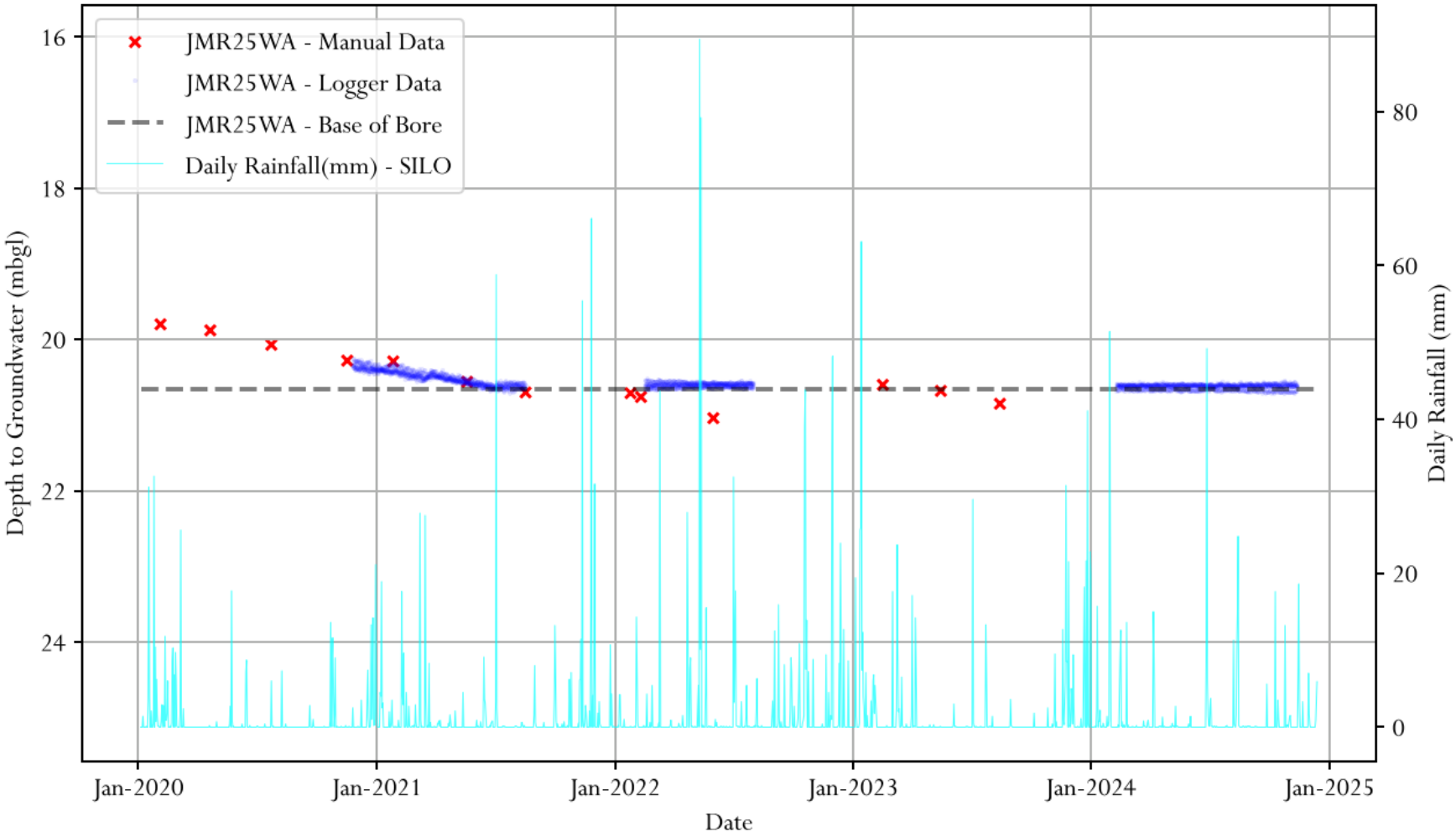


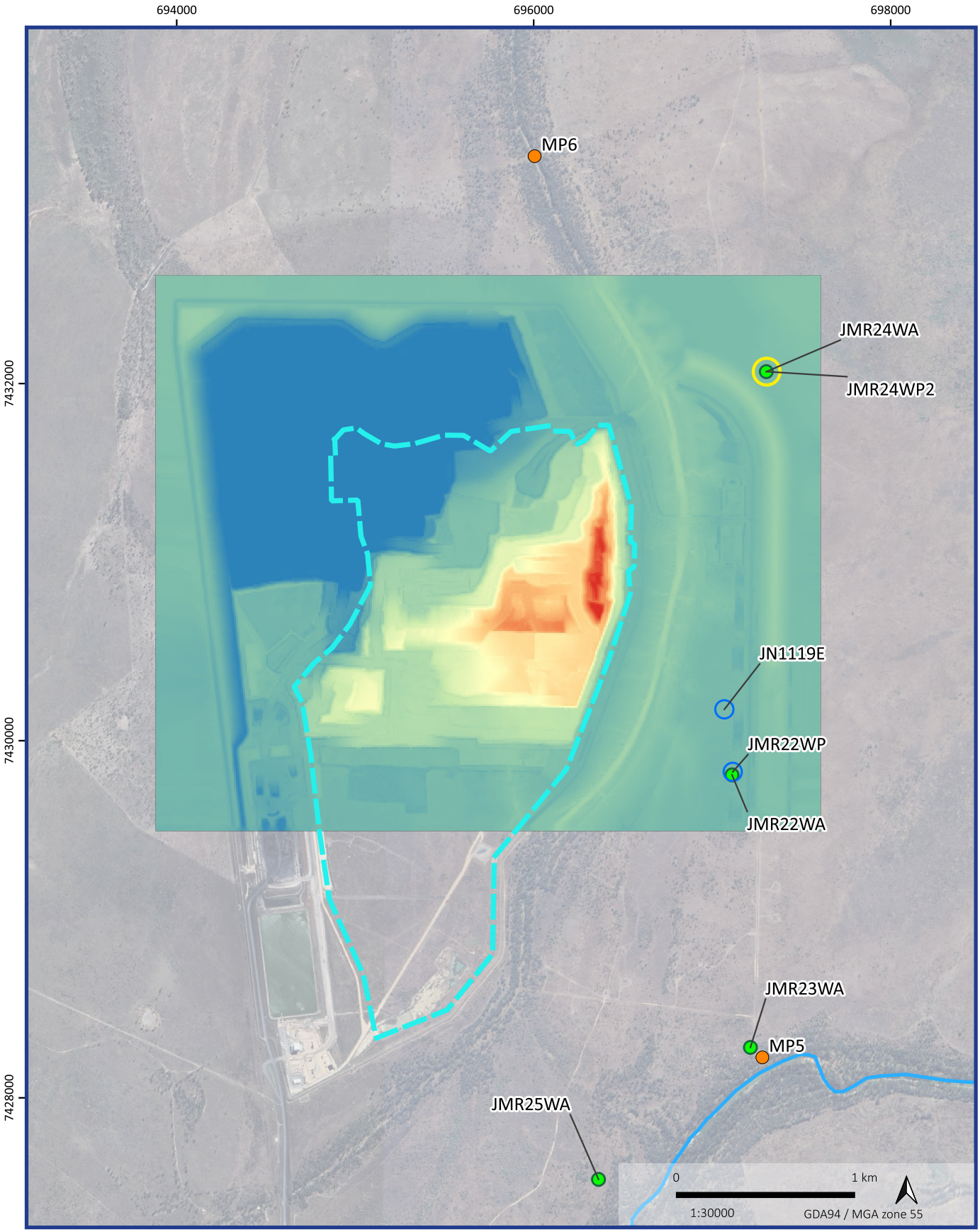
Figure 5-18 Datalogger and manual water level data – JMR25WA

Table 5-4 Observed groundwater level drawdown relative to baseline

Monitoring bore	Unit	Baseline groundwater level (mAHD)[1]	Trigger level threshold - end of mining drawdown (m)[1]	Groundwater level (mAHD) 2024	Observed drawdown (m)[2]	Remaining drawdown (m) until trigger threshold
JMR4WA	Alluvium	103.25	10 to 20	102.02	-1.23	8.77 to 18.77
JMR4WP2	Permian	103.2	18	102.05	-1.15	16.85
JMR22WA	Alluvium	Dry	N/A	Dry	-	-
JMR22WP	Permian	101.24	90	98.69	-2.55	87.45
JN1119E	Permian	100.79	100	94.29	-6.5	93.5
JMR23WA	Alluvium	Dry	N/A	104.52	-	-
JMR24WA	Alluvium	Dry	N/A	Dry	-	-
JMR24WP2	Permian	77.81	55	79.61	1.8	56.8
JMR25WA	Alluvium	102.43	5 to 10	Dry	-	Dry
JMR26WA	Alluvium	Dry	N/A	Dry	-	-
JP0911T	Alluvium	99.48	N/A	-	-	-
JP0912T	Alluvium	100.89	N/A	-	-	-

Notes: *1. From Table I3 of EA (refer also Table 5-3 of this report)*

2. Difference in water level between baseline water level and October 2022 observed water level – a negative value indicates water level drawdown relative to baseline value



©2025 Oasis Hydrogeology Pty Ltd - trading as hydrogeologist.com.auSource: 1 second SRTM Derived DEM-S - © Commonwealth of Australia (Geoscience Australia) 2011.; GEODATA TOPO 250K Series 3 - © Commonwealth of Australia (Geoscience Australia) 2006.\\HYDRO-NAS\Data\4000_Projects\4159D_Jellinbah_Mackenzie North Annual GW Monitoring Report\3_GIS\3_11_Workspaces_QGIS\4159D_Figure 5-19_Ground elevation contours mining area 2024.qgz

Legend

- Surface water
- Mackenzie River
- Limit of Mining

Bore

- Alluvium
- Permian-Pollux seam
- Permian overburden

Elevation (mAHD)

20	100
40	120
60	140
80	

Mining area ground elevation December 2024

(4159D) Mackenzie North Project
Annual Groundwater Monitoring Report 2024

Figure 5-19

25/02/2025

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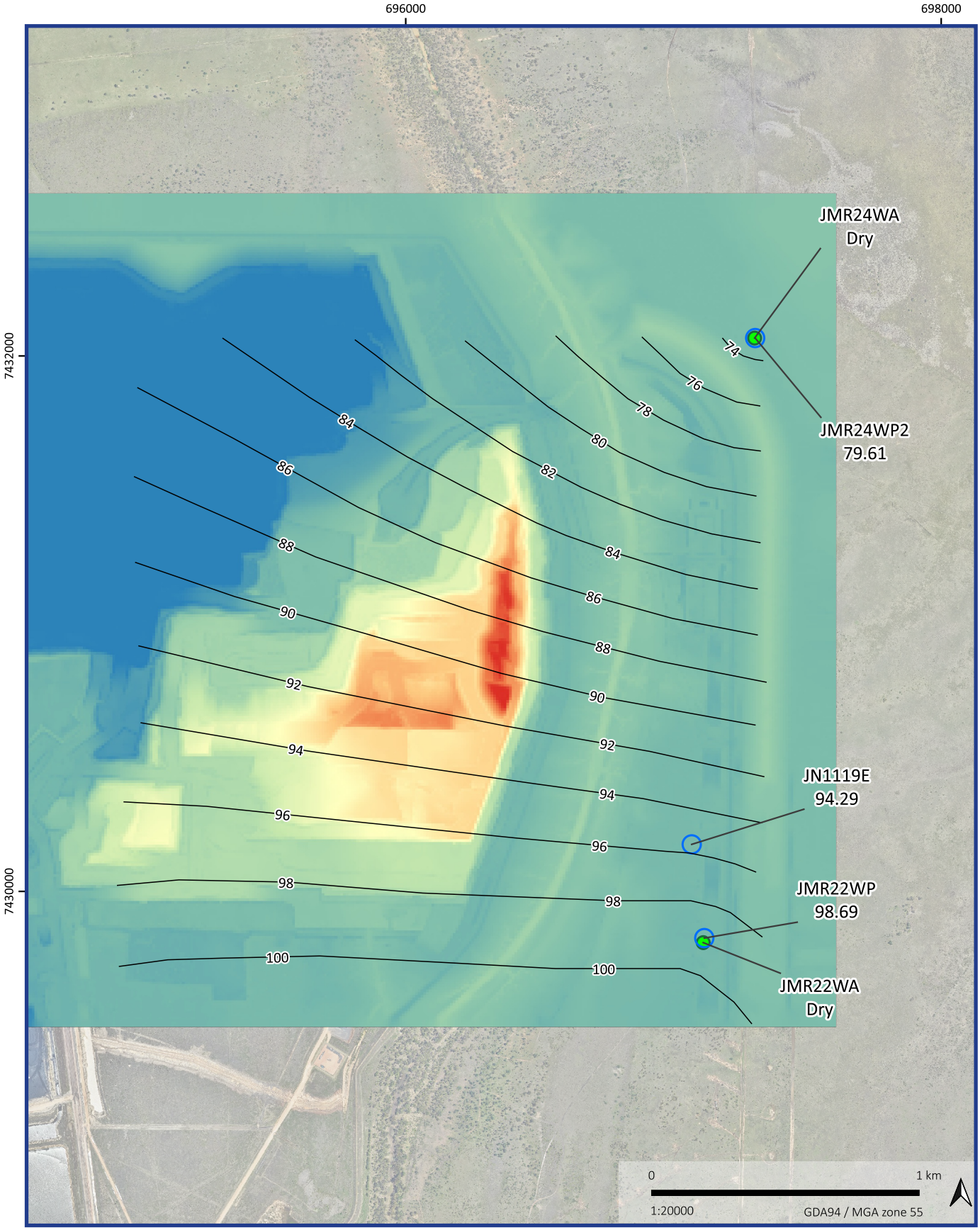

©2025 Oasis Hydrogeology Pty Ltd - trading as hydrogeologist.com.auSource: 1 second SRTM Derived DEM-S - © Commonwealth of Australia (Geoscience Australia) 2011.; GEODATA TOPO 250K Series 3 - © Commonwealth of Australia (Geoscience Australia) 2006.Z:\4000_Projects\4159D_Jellinbah_Mackenzie North Annual GW Monitoring Report\3_GIS\3_11_Workspaces_QGIS\4159D_Figure 5-20_2024 Groundwater elevation relative to pre-mining (Dec 2012) groundwater level.qgz

Legend

— Contour (mAHD)

Bore

- Alluvium
- Permian

Depth of mining (mAHD)

20 80 140
40 100
60 120

2024 Groundwater elevation relative to pre-mining (Dec 2012) contours

(4159D) Mackenzie North Project
Annual Groundwater Monitoring Report 2024

Figure 5-20

21/02/2025

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6. Assessment of surface water data

Condition I17 of the EA requires that the AGMR include a comparison of groundwater monitoring results with receiving environment surface water quality monitoring results, to determine any interaction or impact from groundwater on surface water. Following review of available groundwater surface water monitoring data the following observations are made:

- Within the impacted zone for groundwater drawdown, groundwater flow will be towards the pit and impacts away from the mining area could not be expected to occur via the deeper Permian coal measures which occur at depths of > 20 mbgl. The Permian coal measures are expected to be disconnected from the surface water system.
- Where groundwater is observed in the alluvium (generally in bores in close proximity to the Mackenzie River), the depth to groundwater is also in the order of 20 mbgl. In all alluvium monitoring bores that are close to the current mining area, the alluvium is currently dry and has been dry since the commencement of monitoring and pre-mining.
- The locations of surface water monitoring points are shown in Figure 4-1. Based on the overall direction of groundwater flow from south to north and the disconnected nature of groundwater in the alluvium (as the alluvium is dry over much of the mining area), the most likely indicator of current surface water / groundwater impacts related to mining would be at surface water monitoring points.

Table 6-1 provides summary statistics for the EC of surface water sites and the EC of groundwaters (alluvium and Permian). The 2024 surface water EC values are less than 446 µS/cm, while the groundwater EC values are greater than 4,040 µS/cm. The significant difference in EC values between surface waters and shallow groundwaters, indicates that there is currently no interaction between groundwaters and surface waters at the site.

Table 6-1 Electrical conductivity at surface water and groundwater sampling sites

Monitoring location		2022 Value	2023 Value	2024 Value
Surface water sites	MP4	167	355	446
	MP5	328	381	443
Groundwater sites	Alluvium	2072 – 5,856	3,060 – 3,420	4,040 – 6,570
	Permian	3,803 – 17,152	3,624 – 16,842	3,510 – 19,400

7. Summary and conclusions

Following review of the available data, the following summary and conclusions are made:

- Monitoring of groundwater level and groundwater quality is occurring at 12 monitoring sites at the Mackenzie North Project. The frequency and parameters of this monitoring are in accordance with the requirements of the EA.
- During the 12-month period covered by this report, no new groundwater monitoring bores have been installed, and no bores have been decommissioned.
- Groundwater levels in the alluvium have not been impacted by mining activities. Several of the alluvium monitoring bores are dry and have been for some time. The alluvium within the mining area was dry pre-mining, and in those alluvial bores with recorded groundwater levels, the responses are interpreted to be related to climatic conditions.
- Groundwater levels in the Permian coal measures have locally been impacted by mining activities. However, these impacts are consistent with the predicted and approved drawdown of the mine on the pre-mine groundwater levels. Several of the Permian monitoring bores do not show mining impact.
- The majority of groundwater quality observations are below the prescribed contaminant limits and to date there have been no exceedances.
- Considering available metal/metalloid data and historical values, the exceedances for dissolved chromium at JMR22WP, dissolved copper at JMR4WA and dissolved molybdenum at JMR22WP and JN1119E are unlikely to result in environmental harm and continued monitoring is recommended.
- Permian monitoring bore JN1119E has historically recorded dissolved molybdenum concentrations above the contaminant limit. Consistent with previous reporting JN1119E, which regularly recorded dissolved molybdenum values more than the contaminant limit. As recommended previously, it is assessed that JN1119E be removed from the monitoring program as a water quality assessment bore but retaining the bore for the purpose of groundwater level assessment. A number of bores regularly record TPH C10-C36 concentrations where historic data is above the contaminant limit for three consecutive samples. All bores show a decreasing trend in TPH C10-C36 fraction data over the 2024 reporting period. The presence of hydrocarbon contamination in groundwater is not suspected as the high concentrations exist from the period that is pre-mining activities. The silica gel cleanup method has been carried and has confirmed that the hydrocarbons are likely to be biogenic (naturally occurring) and therefore not indicative of contamination due to site activities. It is recommended that the silica gel cleanup method should be routinely carried out as part of the compliance sampling to confirm this assessment and minimise any exceedances of the contaminant limit.
- The significant difference between surface water and groundwater EC values, as well as the relatively deep groundwater levels (generally >20 mbgl) in the monitoring bores, indicate that there is currently no interaction between groundwaters and surface waters at the site.

Appendix A Water quality monitoring data

Mackenzie North Groundwater Quality Monitoring
pH, EC, TDS, Major Ions, Hydrocarbon Data

		pH		Electrical		TDS	Major Ions										Total Petroleum								
Bore ID	Sample Date	Field	Lab	Field	Lab	Total Dissolved Solids (TDS)	Calcium	Magnesium	Sodium	Potassium	Chloride	Sulfate	Hydroxide Alkalinity	Carbonate Alkalinity	Bicarbonate Alkalinity	Total Alkalinity	C6 - C9 Fraction	C10 - C14 Fraction	C15 - C28 Fraction	C29 - C36 Fraction	C10 - C36 Fraction (sum)	C10 - C14 Fraction (SVSG)	C15 - C28 Fraction (SVSG)	C29 - C36 Fraction (SVSG)	C10 - C36 (sum) Fraction (SVSG)
		pH	pH	µS/c	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L				
JMR22WP	16/2/2023	12.41	12.1	10748	10400	5770	371	<1	1320	35	1960	68	1000	101	<1	1100	<20	70	150	<50	220				
JMR22WP	16/5/2023	7.84	8.07	16551	17400	10800	108	68	3660	10	6000	1	<1	<1	144	144	<20	<50	<100	<50	<50	<50	<100	<50	<50
JMR22WP	14/8/2023	8.36	8.24	16842	19400	11200	166	75	3760	11	5150	1	<1	<1	139	139	<20	<50	<100	<50	<50	<50	<100	<50	<50
JMR22WP	21/11/2023	11.67	12	9453	8670	4160	320	<1	1160	70	1630	63	699	57	<1	756	<20	140	600	<50	740	<50	<100	<50	<50
JMR22WP	8/2/2024	11.6	12.2	8547	9010	4410	326	<1	1120	59	1720	67	882	64	<1	946	<20	50	340	<50	390	<50	<100	<50	<50
JMR22WP	8/5/2024	11.79	12.2	8651	8970	3930	385	<1	1120	44	1590	56	831	67	<1	899	<20	70	240	<50	310	<50	<100	<50	<50
JMR22WP	4/9/2024	11.64	12.2	9497	8410	3880	331	<1	1020	29	1660	58	780	78	<1	859	<20	60	130	<50	190	<50	<100	<50	<50
JMR24WP	12/11/2019	7.56	8.14	9490	9570	6530	224	131	1590	8	3270	8	<1	<1	222	222	<20	<50	<100	<50	<50				
JMR24WP	20/4/2020	7.53	7.97	7950	8250	5190	202	152	1220	8	2670	<1	<1	<1	198	198	<20	<50	<100	<50	<50				
JMR24WP	16/11/2020	7.61	7.98	8269	7860	5570	203	147	1300	9	2800	4	<1	<1	215	215	<20	<50	<100	<50	<50				
JMR24WP	26/1/2021	7.33	7.98	8308	8020	5210	191	144	1200	7	2850	12	<1	<1	204	204	<20	<50	<100	<50	<50				
JMR24WP	19/5/2021	7.32	7.94	7966	7810	4510	180	124	1170	7	2740	2	<1	<1	203	203	<20	<50	<100	<50	<50				
JMR24WP	24/1/2022	7.58	8.04	7752	7790	5140	189	137	1300	8	2720	1	<1	<1	212	212	<20	<50	<100	<50	<50				
JMR24WP	8/6/2022	7.6	8.09	7670	7830	5260	181	132	1300	8	2680	1	<1	<1	204	204	<20	<50	<100	<50	<50				
JMR24WP	5/10/2022	7.24	7.77	7875	8230	4630	168	126	1290	7	2630	2	<1	<1	221	221	<20	<50	<100	<50	<50				
JMR24WP2	20/4/2020	7.38	7.96	8587	8870	5500	182	125	1420	8	2910	2	<1	<1	204	204	<20	<50	<100	<50	<50				
JMR24WP2	17/11/2020	7.4	7.86	8036	7730	5190	172	111	1370	7	2750	<1	<1	<1	214	214	<20	<50	<100	<50	<50				
JMR24WP2	27/1/2021	6.79	7.8	11491	11200	6420	281	171	1910	8	3430	404	<1	<1	992	992	70	<50	960	610	1570				
JMR24WP2	19/5/2021	7.34	7.96	7553	7400	4250	139	90	1150	7	2550	<1	<1	<1	233	233	<20	<50	<100	<50	<50				
JMR24WP2	24/1/2022	7.54	8.07	7059	7110	4550	144	97	1290	7	2350	<1	<1	<1	282	282	<20	50	150	120	320				
JMR24WP2	8/6/2022	7.62	8.2	6912	7060	4460	134	93	1270	6	2260	<1	<1	<1	266	266	<20	<50	<100	80	80				
JMR24WP2	5/10/2022	7.31	7.89	7116	7460	4410	120	90	1280	6	2280	6	<1	<1	298	298	<20	<50	<100	<50	<50				
JMR24WP2	16/2/2023	7.8	7.47	6912	6390	4030	122	82	1160	7	2100	1	<1	<1	311	311	<20	<50	<100	<50	<50				
JMR24WP2	8/5/2023	7.25	8.12	7397	8060	4560	157	122	1230	8	2540	1	<1	<1	207	207	<20	<50	<100	<50	<50	<50	<100	<50	<50
JMR24WP2	14/8/2023	7.25	7.9	7487	8830	4960	191	135	1270	8	2700	2	<1	<1	202	202	<20	<50	<100	<50	<50	<50	<100	<50	<50
JMR24WP2	21/11/2023	7.22	7.92	7671	7890	5380	170	127	1220	8	2620	<1	<1	<1	197	197	<20	<50	<100	<50	<50	<50	<100	<50	<50
JMR24WP2	8/2/2024	7.3	7.78	7591	7690	4890	175	126	1190	8	2590	<1	<1	<1	217	217	<20	<50	<100	<50	<50	<50	<100	<50	<50
JMR24WP2	8/5/2024	7.27	7.78	7257	7420	4940	174	120	1130	7	2490	2	<1	<1	213	213	<20	<50	<100	<50	<50	<50	<100	<50	<50
JMR24WP2	6/8/2024	7.03	7.91	7560	7580	4860	169	128	1220	8	2560	<1	<1	<1	241	241	<20	<50	<100	<50	<50	<50	<100	<50	<50
JMR25WA	11/9/2018	6.45	7.01	1171	1190	905	67	43	66	5	282	14	<1	<1	161	161	<20	<50	100	50	150				
JMR25WA	29/11/2018	6.45	6.93	1299	1200	738	81	44	80	5	298	17	<1	<1	153	153	<20	<50	<100	<50	<50				
JMR25WA	24/1/2019	6.5	6.99	1273	1200	1010	82	44	83	5	302	15	<1	<1	171	171	<20	<50	<100	<50	<50				
JMR25WA	27/3/2019	6.66	7.51	1292	1260	909	93	49	97	6	297	16	<1	<1	163	163	<20	<50	<100	<50	<50				
JMR25WA	15/5/2019	6.47	7.14	1374	1220	919	96	50	96	5	334	16	<1	<1	166	166	<20	<50	<100	<50	<50				
JMR25WA	25/7/2019	6.78	7.03	1272	1280	815	82	43	87	5	316	14	<1	<1	184	184	<20	<50	<100	<50	<50				
JMR25WA	12/11/2019	6.44	7.32	1285	1280	942	90	45	99	5	327	8	<1	<1	189	189	<20	<50	<100	<50	<50				
JMR25WA	20/4/2020	6.54	7.44	1561	1560	1040	99	60	122	3	401	6	<1	<1	197	197	<20	<50	<100	<50	<50				
JMR25WA	16/11/2020	6.54	7.16	1904	1870	1430	120	74	159	4	522	5	<1	<1	242	242	<20	<50	<100	<50	<50				
JMR25WA	26/1/2021	6.56	7.55	2029	1920	1460	113	74	153	2	545	6	<1	<1	235	235	<20	<50	<100	<50	<50				
JMR25WA	19/5/2021	6.74	7.71	2358	2220	1510	124	77	178	2	656	2	<1	<1	276	276	<20	<50	<100	60	60				
JMR25WA	24/1/2022	6.68	7.48	2072	2070	1670	130	80	183	5	590	3	<1	<1	270	270	<20	<50	170	120	290				
JMR4WA	9/9/2018	6.51	7.05	7189	6570	3610	271	275	783	8	1620	96	<1	<1	838	838	<20	60	140	<50	200				
JMR4WA	18/11/2018	6.54	6.97	6665	6450	3980	290	253	793	8	1440	81	<1	<1	834	834	<20	<50	<100	<50	<50				
JMR4WA	24/1/2019	6.4	7.13	6604	6360	4280	299	253	784	8	1670	78	<1	<1	843	843	<20	<50	<100	<50	<50				
JMR4WA	27/3/2019	6.73	7.68	6407	6400	3990	294	254	795	8	1510	88	<1	<1	832	832	<20	70	130	<50	200				
JMR4WA	15/5/2019	6.56	7.07	6547	6070	4440	302	247	757	8	1720	102	<1	<1	794	794	<20	70	130	<50	200				
JMR4WA	24/7/2019	6.37	7.03	6614	6550	4170	286	233	727	8	1660	105	<1	<1	882	882	<20	<50	<100	<50	<50				
JMR4WA	12/11/2019	6.5	7.51	6161	6230	4310	287	228	716	7	1660	100	<1	<1	763	763	<20	<50	2170	850	3020				
JMR4WA	20/4/2020	6.56	7.36	6133	6320	3800	244	236	683	8	1660	98	<1	<1	704	704	<20	<50	<100	<50	<50				
JMR4WA	16/11/2020	7.26	7.88	4197	4040	2270	77	68	743	4	1100	66	<1	<1	475	475	<20	<50	<100	<50	<50				
JMR4WA	26/1/2021	6.51	7.65	6333	6110	4240	260	240	676	7	1680	99	<1	<1	679	679	<20	<50	220	<50	220				
JMR4WA	19/5/2021	6.59	7.55	6053	5890	3840	227	196	577	7	1640	93	<1	<1	668	668	<20	<50	140	<50	140				
JMR4WA	24/1/2022	6.54	7.42	5856	5820	4020	235	214	622	7	1590	91	<1	<1	677	677	<20	50	130	<50	180				
JMR4WA	8/6/2022	6.51	7.69	5529	5710	3850	231	229	659	8	1550	74	<1	<1	617	617	<20	<50	360	50	410				
JMR4WA	5/10/2022	6.58	7.26	5627	5960	3990	219	213	644	7	1500	87	<1	<1	646	646	<20	<50	150	<50	150				
JMR4WA	15/5/2023	6.53	7.93	5010	5430	3060	192	198	574	8	1400	74	<1	<1	554	554	<20	50	110	<50	160	<50	<100	<50	<50
JMR4WA	14/8/2023	6.55	7.3	4792	5350	3060	214	203	559	8	1340	76	<1	<1	508	508	<20	60	140	<50	200	<70	<100	<50	<50
JMR4WA	22/11/2023	6.56	7.37	4519	4830	3420	182	182	524	8	1260	70	<1	<1	486	486	<20	<50	<100	<50	<50	<50	<100	<50	<50
JMR4WA	8/2/2024	6.71	7.27	3986	4010	2750	174	161	479	8	1130	18	<1	<1	469	469	<20	<50	1060	120	1180	<50	<100	<50	<50
JMR4WA	8/5/2024	6.73	7.49	4406	4690	3240	195	179	514	9	1580	81	<1	<1	497	497	<20	<50	<100	<50	<50	<50	<100	<50	<50
JMR4WA	6/8/2024	6.54	7.65	4607	4710	3290	188	188	524	8	1200	66	<1	<1	527	527	<20	<50	<100	<50	<50	<50	<100	<50	<50
JMR4WP	9/9/2018	7.07	7.65	7450	6870	4050	140	110	1070	5	1860	38	<1	<1	458	458	<20	<50	<100	<50	<50				
JMR4WP	18/11/2018	7.08	7.44	8921	8600	5010	252	143	1490	7	2710	22	<1	<1	428	428	<20	<50	<100	<50	<50				
JMR4WP	24/1/2019	6.91	7.54	9883	9500	5620	263	153	1570	6	3160	22	<1	<1	432	432	<20	<50	<100	<50	<50				
JMR4WP	27/3/2019	7.29	8.01	9096	9070	5620	280	146	1610	7	2830	18	<1	<1	428	428	<20	<50	<100	<50	<50				
JMR4WP	15/5/2019	7.06	7.68	9235	8620	5650	345	149	1650	7	3060	22	<1	<1	419	419	<20	<50	<100	<50	<50				
JMR4WP	25/7/2019	6.9	7.59	8725	8760	5250	254	128	1380	6	2800	18	<1	<1	480	480	<20	<50	<100	<50	<50				
JMR4WP	16/11/2020	6.62	7.28	6190	5920	4270	267	241	710	8	1640	98	<1	<1	696	696	<20	<50	160	<50	160				
JMR4WP	26/1/2021	7.21	8.13	4099	3980	2170	62	65	695	4	1060	64	<1	<1	473	473	20	<50	<100	<50	<50				
JMR4WP	19/5/2021	7.33	8.11	4046	3930	2170	61	53	621	4	1070	56	<1	<1	476	476	20	<50	<100	<50	<50				

Bore ID	Sample Date	pH		Electrical		TDS	Major Ions										Total Petroleum								
		Field	Lab	Field	Lab	Total Dissolved Solids (TDS)	Calcium	Magnesium	Sodium	Potassium	Chloride	Sulfate	Hydroxide Alkalinity	Carbonate Alkalinity	Bicarbonate Alkalinity	Total Alkalinity	C6 - C9 Fraction	C10 - C14 Fraction	C15 - C28 Fraction	C29 - C36 Fraction	C10 - C36 Fraction (sum)	C10 - C14 Fraction (SVSG)	C15 - C28 Fraction (SVSG)	C29 - C36 Fraction (SVSG)	C10 - C36 (sum) Fraction (SVSG)
		pH	pH	µS/cm	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L				
JMR4WP	24/1/2022	7.34	8.05	4207	4220	2330	63	56	670	4	1140	48	<1	<1	503	503	<20	<50	<100	<50	<50				
JMR4WP	8/6/2022	7.13	8.14	3803	3930	2170	68	66	723	4	1040	43	<1	<1	457	457	<20	<50	<100	<50	<50				
JMR4WP	5/10/2022	7.31	7.89	3952	3990	2180	66	57	733	5	1010	42	<1	<1	486	486	<20	<50	<100	<50	<50				
JMR4WP2	16/5/2023	7.2	8.29	3946	3510	2170	67	58	726	5	1040	40	<1	<1	462	462	<20	<50	<100	<50	<50	<50	<100	<50	<50
JMR4WP2	22/11/2023	7.26	8.07	3624	4320	2390	71	64	722	5	1050	41	<1	<1	457	457	<20	<50	<100	<50	<50	<50	<100	<50	<50
JMR4WP2	8/2/2024	7.3	7.86	3448	3790	2100	65	56	614	7	964	39	<1	<1	469	469	<20	<50	<100	<50	<50	<50	<100	<50	<50
JMR4WP2	8/5/2024	7.21	8.11	3894	4150	2340	79	66	707	5	1090	39	<1	<1	477	477	<20	<50	<100	<50	<50	<50	<100	<50	<50
JMR4WP2	6/8/2024	7.08	8.09	4269	4290	2340	75	67	761	5	1080	35	<1	<1	526	526	<20	<50	<100	<50	<50	<50	<100	<50	<50
JN1119E	13/11/2019	8.6	8.35	17353	18000	11400	98	99	3550	10	6300	3	<1	5	119	124	<20	<50	<100	80	80				
JN1119E	20/4/2020	11.97	11.6	13343	13100	7670	90	<1	2550	17	3860	11	396	113	<1	509	<20	50	170	<50	220				
JN1119E	16/11/2020	11.88	11.6	13958	12800	6880	81	<1	2680	18	4060	10	468	109	<1	578	<20	50	280	<50	330				
JN1119E	26/1/2021	11.97	11.4	12691	11400	5310	7	<1	2240	12	3520	16	349	308	<1	657	<20	<50	240	<50	240				
JN1119E	19/5/2021	11.98	11.6	11974	11100	6360	<1	<1	2240	12	3290	16	433	294	<1	727	<20	<50	210	<50	210				
JN1119E	24/1/2022	12.08	12	11791	11300	6340	22	<1	2250	12	2870	18	712	253	<1	964	<20	70	200	<50	270				
JN1119E	8/6/2022	12.01	11.6	10851	10300	5770	5	<1	2300	11	3100	14	379	394	<1	773	<20	50	130	<50	180				
JN1119E	5/10/2022	12.03	11.8	12838	12700	5910	15	<1	2470	11	3140	12	733	340	<1	1070	<20	50	110	<50	160				
JN1119E	16/5/2023	12.04	12	12822	11800	5390	94	<1	2240	11	2580	16	805	414	<1	1220	<20	80	140	<50	220	<50	<100	<50	<50
JN1119E	14/8/2023	12.01	12.1	14181	14400	6300	172	<1	2530	11	3160	13	1030	268	<1	1300	<20	<50	<100	<50	<50	<50	<100	<50	<50
JN1119E	21/11/2023	11.73	12	13844	12700	6060	151	<1	2190	10	2980	16	850	309	<1	1160	<20	70	110	<50	180	<50	<100	<50	<50
JN1119E	8/2/2024	11.71	12.3	13348	13300	6590	230	<1	1940	10	2510	16	1400	295	<1	1700	<20	<50	<100	<50	<50	<50	<100	<50	<50
JN1119E	8/5/2024	11.73	12.3	12848	12700	5200	267	<1	1870	10	2260	16	1410	140	<1	1550	<20	80	<100	<50	80	<50	<100	<50	<50
JN1119E	4/9/2024	11.62	12.2	13870	13400	5350	228	<1	1840	10	2320	15	1430	161	<1	1590	<20	50	<100	<50	50	<50	<100	<50	<50

Mackenzie North Groundwater Quality Monitoring

Dissolved Metals/Metalloids Data

Bore ID	Sample Date	Dissolved Metals																
		Aluminium	Arsenic	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Uranium	Vanadium	Zinc	Boron	Iron
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
JMR22WP	16/2/2023	0.06	0.001	<0.0001	0.061	<0.001	0.008	0.002	<0.001	<0.0001	0.094	0.004	<0.01	<0.001	<0.001	<0.01	<0.005	0.14	0.1
JMR22WP	16/5/2023	0.01	0.002	<0.0001	<0.001	<0.001	<0.001	<0.001	0.084	<0.0001	0.002	0.001	<0.01	<0.001	<0.001	<0.01	0.011	0.52	0.06
JMR22WP	14/8/2023	0.01	0.003	<0.0001	<0.001	<0.001	<0.001	<0.001	0.054	<0.0001	0.003	<0.001	<0.01	<0.001	<0.001	<0.01	0.01	0.56	<0.05
JMR22WP	21/11/2023	0.17	0.001	<0.0001	0.062	<0.001	0.011	0.002	<0.001	<0.0001	0.09	0.004	<0.01	<0.001	<0.001	<0.01	0.012	0.12	0.17
JMR22WP	16/2/2024	0.06	0.001	<0.0001	0.061	<0.001	0.008	0.002	<0.001	<0.0001	0.094	0.004	<0.01	<0.001	<0.001	<0.01	<0.005	0.14	0.1
JMR22WP	8/5/2024	0.14	0.001	<0.0001	0.054	<0.001	0.007	<0.001	<0.001	<0.0001	0.077	0.004	<0.01	<0.001	<0.001	<0.01	0.007	0.11	0.22
JMR22WP	5/9/2024	0.12	0.002	<0.0001	0.046	<0.001	0.005	<0.001	<0.001	<0.0001	0.079	0.003	<0.01	<0.001	<0.001	<0.01	<0.005	0.12	0.25
JMR23WA	16/2/2023	<0.01	0.02	<0.0001	<0.001	0.001	<0.001	<0.001	0.822	<0.0001	0.003	0.006	<0.01	<0.001	<0.001	<0.01	<0.005	0.08	2.09
JMR23WA	16/5/2023	0.01	0.005	<0.0001	<0.001	0.001	<0.001	<0.001	0.911	<0.0001	0.002	0.004	<0.01	<0.001	<0.001	<0.01	<0.005	<0.05	1.89
JMR23WA	14/8/2023	0.01	0.006	<0.0001	<0.001	<0.001	<0.001	<0.001	1.07	<0.0001	0.002	0.004	<0.01	<0.001	<0.001	<0.01	0.036	0.08	2.68
JMR24WP	12/11/2019	<0.01	0.002	<0.0001	0.004	<0.001	<0.001	<0.001	0.193	<0.0001	0.008	0.02	<0.01	<0.001	<0.001	<0.01	0.01	0.51	<0.05
JMR24WP	20/4/2020	<0.01	0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	0.196	<0.0001	0.001	0.009	<0.01	<0.001	<0.001	<0.01	0.014	0.49	<0.05
JMR24WP	16/11/2020	<0.01	0.002	<0.0001	0.002	<0.001	0.003	<0.001	0.214	<0.0001	0.004	0.017	<0.01	<0.001	<0.001	<0.01	0.019	0.36	<0.05
JMR24WP	26/1/2021	<0.01	0.002	<0.0001	<0.001	<0.001	<0.001	<0.001	0.22	<0.0001	0.002	0.005	<0.01	<0.001	<0.001	<0.01	0.017	0.46	<0.05
JMR24WP	19/5/2021	<0.01	0.002	<0.0001	<0.001	<0.001	<0.001	<0.001	0.218	<0.0001	0.002	0.004	<0.01	<0.001	<0.001	<0.01	0.017	0.46	<0.05
JMR24WP	24/1/2022	<0.01	0.002	<0.0001	0.016	<0.001	0.002	<0.001	0.248	<0.0001	0.016	0.072	<0.01	<0.001	<0.001	<0.01	0.014	0.51	<0.05
JMR24WP	8/6/2022	<0.01	0.002	<0.0001	<0.001	<0.001	0.002	<0.001	0.2	<0.0001	0.001	0.004	<0.01	<0.001	<0.001	<0.01	0.016	0.61	<0.05
JMR24WP	5/10/2022	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	0.219	<0.0001	0.002	0.008	<0.01	<0.001	<0.001	<0.01	0.03	0.55	<0.05
JMR24WP2	20/4/2020	<0.01	0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	0.257	<0.0001	0.002	0.005	<0.01	<0.001	<0.001	<0.01	0.012	0.43	0.2
JMR24WP2	17/11/2020	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	0.258	<0.0001	0.002	0.006	<0.01	<0.001	<0.001	<0.01	0.047	0.39	0.21
JMR24WP2	27/1/2021	0.02	0.003	<0.0001	0.003	<0.001	<0.001	<0.001	0.321	<0.0001	0.002	0.002	<0.01	<0.001	0.002	<0.01	<0.005	1.26	0.06
JMR24WP2	19/5/2021	<0.01	0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	0.217	<0.0001	0.002	0.003	<0.01	<0.001	<0.001	<0.01	0.011	0.5	0.16
JMR24WP2	24/1/2022	`	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	0.23	<0.0001	0.002	0.004	<0.01	<0.001	<0.001	<0.01	0.008	0.6	<0.05
JMR24WP2	8/6/2022	<0.01	0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	0.202	<0.0001	0.003	0.003	<0.01	<0.001	<0.001	<0.01	0.008	0.64	<0.05
JMR24WP2	5/10/2022	<0.01	0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	0.204	<0.0001	0.002	0.006	<0.01	<0.001	<0.001	<0.01	0.024	0.59	0.45
JMR24WP2	16/2/2023	<0.01	0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	0.168	<0.0001	0.002	0.001	<0.01	<0.001	<0.001	<0.01	0.007	0.6	0.1
JMR24WP2	16/5/2023	0.01	0.003	<0.0001	<0.001	<0.001	<0.001	<0.001	0.219	<0.0001	0.001	0.001	<0.01	<0.001	<0.001	<0.01	0.014	0.5	0.37
JMR24WP2	14/8/2023	<0.01	0.002	<0.0001	<0.001	<0.001	<0.001	<0.001	0.225	<0.0001	0.002	0.003	<0.01	<0.001	<0.001	<0.01	0.007	0.54	0.05
JMR24WP2	21/11/2023	<0.01	0.001	<0.0001	<0.001	<0.001	0.008	<0.001	0.258	<0.0001	0.002	0.002	<0.01	<0.001	<0.001	<0.01	0.046	0.51	0.09
JMR24WP2	8/2/2024	<0.01	0.004	<0.0001	<0.001	<0.001	<0.001	<0.001	0.213	<0.0001	0.002	0.003	<0.01	<0.001	<0.001	<0.01	0.013	0.52	0.55
JMR24WP2	8/5/2024	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	0.221	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005	0.18	0.2
JMR24WP2	6/8/2024	<0.01	0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	0.232	<0.0001	0.001	0.002	<0.01	<0.001	<0.001	<0.01	0.022	0.52	<0.05
JMR25WA	11/9/2018	0.01	<0.001	<0.0001	<0.001		0.002	<0.001		<0.0001		0.001	<0.01				0.014		<0.05
JMR25WA	29/11/2018	<0.01	<0.001	<0.0001	<0.001	-	0.002	<0.001	0.015	<0.0001	<0.001	0.002	<0.01	<0.001	<0.001	<0.01	<0.005	<0.05	<0.05
JMR25WA	24/1/2019	<0.01	<0.001	<0.0001	0.001	<0.001	0.001	<0.001	0.016	<0.0001	<0.001	0.002	<0.01	<0.001	<0.001	<0.01	<0.005	<0.05	<0.05
JMR25WA	27/3/2019	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	0.01	<0.0001	<0.001	0.001	<0.01	<0.001	<0.001	<0.01	<0.005	<0.05	<0.05
JMR25WA	15/5/2019	<0.01	<0.001	<0.0001	<0.001	0.001	<0.001	<0.001	0.088	<0.0001	<0.001	0.002	<0.01	<0.001	<0.001	<0.01	<0.005	<0.05	<0.05
JMR25WA	25/7/2019	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	0.006	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005	<0.05	<0.05
JMR25WA	12/11/2019	<0.01	<0.001	0.0002	<0.001	<0.001	0.005	<0.001	0.022	<0.0001	<0.001	0.005	<0.01	<0.001	<0.001	<0.01	0.013	<0.05	<0.05
JMR25WA	20/4/2020	<0.01	<0.001	<0.0001	<0.001	0.003	<0.001	<0.001	0.216	<0.0001	<0.001	0.012	<0.01	<0.001	<0.001	<0.01	0.005	<0.05	<0.05
JMR25WA	16/11/2020	<0.01	<0.001	<0.0001	<0.001	<0.001	0.001	<0.001	0.055	<0.0001	<0.001	0.007	<0.01	<0.001	0.001	<0.01	0.011	<0.05	<0.05
JMR25WA	26/1/2021	<0.01	0.001	<0.0001	<0.001	0.006	<0.001	<0.001	0.769	<0.0001	<0.001	0.014	<0.01	<0.001	0.002	<0.01	<0.005	<0.05	0.09
JMR25WA	19/5/2021	<0.01	0.002	<0.0001	<0.001	0.01	<0.001	<0.001	1.9	<0.0001	0.001	0.023	<0.01	<0.001	0.002	<0.01	<0.005	<0.05	0.34
JMR25WA	24/1/2022	<0.01	0.004	<0.0001	0.001	0.012	<0.001	<0.001	3.03	<0.0001	0.002	0.021	<0.01	<0.001	0.001	<0.01	0.006	0.07	4.43
JMR4WA	9/9/2018	<0.01	<0.001	<0.0001	<0.001		<0.001	<0.001		<0.0001		<0.001	<0.01				<0.005		5.61
JMR4WA	18/11/2018	<0.01	<0.001	<0.0001	<0.001	-	<0.001	<0.001	1.64	<0.0001	<0.001	<0.001	<0.01	<0.001	0.001	<0.01	<0.005	0.13	5.9
JMR4WA	24/1/2019	<0.01	<0.001	<0.0001	0.002	<0.001	<0.001	<0.001	1.94	<0.0001	<0.001	0.001	<0.01	<0.001	0.001	<0.01	<0.005	<0.05	6.69
JMR4WA	27/3/2019	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	1.9	<0.0001	<0.001	<0.001	<0.01	<0.001	0.002	<0.01	<0.005	0.05	6.49
JMR4WA	15/5/2019	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	1.67	<0.0001	<0.001	<0.001	<0.01	<0.001	0.002	<0.01	<0.005	<0.05	6.45
JMR4WA	24/7/2019	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	1.88	<0.0001	<0.001	<0.001	<0.01	<0.001	0.001	<0.01	<0.005	0.06	6.92
JMR4WA	12/11/2019	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	1.72	<0.0001	<0.001	0.004	<0.01	<0.001	<0.001	<0.01	<0.005	<0.05	5.54
JMR4WA	20/4/2020	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	1.55	<0.0001	<0.001	0.003	<0.01	<0.001	0.002	<0.01	<0.005	<0.05	4.59
JMR4WA	16/11/2020	<0.01	0.015	<0.0001	<0.001	<0.001	0.015	<0.001	0.075	<0.0001	0.004	0.007	<0.01	<0.001	0.002	<0.01	0.061	0.16	<0.05
JMR4WA	26/1/2021	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	1.93	<0.0001	<0.001	0.008	<0.01	<0.001	0.002	<0.01	0.01	0.05	5.11
JMR4WA	19/5/2021	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	1.59	<0.0001	<0.001	0.006	<0.01	<0.001	0.002	<0.01	<0.005	<0.05	4.57
JMR4WA	24/1/2022	<0.01	<0.001	<0.0001	0.013	<0.001	<0.001	<0.001	1.5	<0.0001	0.012	0.062	<0.01	<0.001	<0.001	<0.01	<0.005	<0.05	4.64
JMR4WA	8/6/2022	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	1.64	<0.0001	<0.001	0.017	<0.01	<0.001	0.002	<0.01	0.006	0.09	3.9
JMR4WA	5/10/2022	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	1.49	<0.0001	<0.001	0.005	<0.01	<0.001	0.001	<0.01	<0.005	<0.05	5.36
JMR4WA	15/5/2023	0.01	0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	1.23	<0.0001	<0.001	0.004	<0.01	<0.001	<0.001	<0.01	0.062	0.06	3.67
JMR4WA	14/8/2023	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	1.39	<0.0001	<0.001	0.003	<0.01	<0.001	<0.001	<0.01	0.048	0.05	3.99
JMR4WA	22/11/2023	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	1.24	<0.0001	0.002	0.002	<0.01	<0.001	<0.001	<0.01	0.072	0.07	3.31
JMR4WA	8/2/2024	<0.01	0.004	<0.0001	<0.001	<0.001	<0.001	<0.001	0.971	<0.0001	<0.001	0.004	<0.01	<0.001	<0.001	<0.01	0.013	0.09	1.75
JMR4WA	8/5/2024	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	1.18	<0.0001	0.002	0.003	<0.01	<0.001	<0.001	<0.01	0.052	0.06	2.18
JMR4WA	6/8/2024	<0.01	0.001	<0.0001	<0.001	<0.001	0.003	<0.001	1.2	<0.0001	<0.001	0.003	<0.01	<0.001	<0.001	<0.01	0.109	0.08	2.02
JMR4WP	9/9/2018	<0.01	<0.001	<0.0001	<0.001		<0.001	<0.001		<0.0001		0.001	<0.01				<0.005		0.14
JMR4WP	18/11/2018	<0.01	<0.001	<0.0001	<0.001		<0.001	<0.001	0.096	<0.0001	0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.016	0.25	0.21
JMR4WP	24/1/2019	<0.01	<0.001	<0.0001	0.001	<0.001	<0.001	<0.001	0.104	<0.0001	<0.001	0.001	<0.01	<0.001	<0.001	<0.01	0.006	0.18	0.13
JMR4WP	27/3/2019	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	0.11	<0.0001	0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.009	0.19	0.13
JMR4WP	15/5/2019	<0.01	<0.001	<0.0001	<0.001	<0.001	0.001	<0.001	0.111	<0.0001	0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.012	0.17	0.1
JMR4WP	25/7/2019	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	0.107	<0.0001	0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.007	0.21	0.07
JMR4WP	16/11/2020	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	1.6	<0.0001	<0.001	0.012	<0.01	<0.001	0.002	<0.01	0.012	<0.05	4.17
JMR4WP	26/1/2021	<0.01	0.021	<0.0001	<0.001	0.001	<0.001	<0.001	0.178	<0.0001	0.006	0.003	<0.01	<0.001	0.001	<0.01	0.007	0.16	0.5
JMR4WP	19/5/2021	<0.01	0.014	<0.0001	<0.001	<0.001	<0.001	<0.001	0.135	<0.0001	0.004	0.006	<0.01	<0.001	<0.001	<0.01	<0.005	0.14	<0.05
JMR4WP	24/1/2022	<0.01	0.005	<0.0001	0.003	<0.001	<0.001	<0.001	0.152	<0.0001	0.006	0.02	<0.01	<0.001	<0.001	<0.01	<0.005	<0.05	0.15
JMR4WP	8/6/2022	<0.01	0.004	<0.0001	<0.001	<0.001	<0.001	<0.001	0.141	<0.0001	0.003	0.019	<0.01	<0.001	<0.001	<0.01	<0.005	0.23	0.07
JMR4WP	5/10/2022	<0.01	0.004	<0.0001	<0.001	<0.001	<0.001	<0.001	0.171	<0.0001	0.007	0.009	<0.01	<0.001	<0.001	<0.01	<0.005	0.18	<0.05
JMR4WP2	16/5/2023	0.01	0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	0.187	<0.0001	0.002	0.002	<0.01	<0.001	<0.001	<0.01	<0.005	0.18	0.13
JMR4WP2	22/11/2023	0.01	0.002	<0.0001	<0.001	<0.001	<0.001	<0.001	0.152	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	0.006	0.19	0.14
JMR4WP2	8/2/2024	<0.01	0.002	<0.0001	0.001	<0.001	<0.001	<0.001	0.194	<0.0001	0.004	0.002	<0.01	<0.001	<0.001	<0.01	<0.005	0.18	0.21

Bore ID	Sample Date	Dissolved Metals																	
		Aluminium	Arsenic	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Uranium	Vanadium	Zinc	Boron	Iron
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
JMR4WP2	8/5/2024	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	0.221	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005	0.18	0.2
JMR4WP2	6/8/2024	<0.01	0.002	<0.0001	<0.001	<0.001	<0.001	<0.001	0.176	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005	0.2	0.29
JN1119E	13/11/2019	<0.01	0.007	<0.0001	<0.001	<0.001	<0.001	<0.001	0.01	<0.0001	0.007	0.002	<0.01	<0.001	<0.001	<0.01	0.009	0.52	<0.05
JN1119E	20/4/2020	0.07	0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	0.038	0.001	<0.01	<0.001	<0.001	<0.01	<0.005	0.21	<0.05
JN1119E	16/11/2020	0.02	0.002	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0011	0.05	0.003	<0.01	<0.001	<0.001	<0.01	0.011	0.18	<0.05
JN1119E	26/1/2021	0.02	0.002	0.0002	<0.001	<0.001	<0.001	<0.001	<0.001	0.0003	0.077	0.001	<0.01	<0.001	<0.001	<0.01	<0.005	0.18	<0.05
JN1119E	19/5/2021	0.02	0.002	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0001	0.066	0.003	<0.01	<0.001	<0.001	<0.01	<0.005	0.14	<0.05
JN1119E	24/1/2022	0.24	0.001	<0.0001	0.001	<0.001	<0.001	<0.001	<0.001	0.0002	0.065	0.009	<0.01	<0.001	<0.001	<0.01	<0.005	0.16	<0.05
JN1119E	8/6/2022	0.03	0.002	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0001	0.06	0.002	<0.01	<0.001	<0.001	<0.01	0.006	0.22	<0.05
JN1119E	5/10/2022	0.06	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	0.058	0.001	<0.01	<0.001	<0.001	<0.01	<0.005	0.21	<0.05
JN1119E	16/5/2023	0.02	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	0.069	0.002	<0.01	<0.001	<0.001	<0.01	<0.005	0.13	<0.05
JN1119E	14/8/2023	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0003	0.056	0.002	<0.01	<0.001	<0.001	<0.01	<0.005	0.23	<0.05
JN1119E	21/11/2023	0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	0.055	0.002	<0.01	<0.001	<0.001	<0.01	<0.005	0.17	<0.05
JN1119E	8/2/2024	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	0.054	0.002	<0.01	<0.001	<0.001	<0.01	<0.005	0.13	<0.05
JN1119E	8/5/2024	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	0.051	0.002	<0.01	<0.001	<0.001	<0.01	<0.005	0.1	<0.05
JN1119E	5/9/2024	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	0.054	0.002	<0.01	<0.001	<0.001	<0.01	<0.005	0.14	<0.05

Appendix B Water level monitoring data

Mackenzie North Groundwater Level Monitoring

Standing Water Level (SWL) - metres below top of casing (mTOC)

Date	JMR4WA	JMR4WP2	JMR22WA	JMR22WP	JN1119E	JMR23WA	JMR24WA	JMR24WP	JMR24WP2	JMR25WA	JMR26WA	JP0911T	JP0912T
15/12/2012	Dry	17.0	dry	22.8		18.7	dry	47.4		16.9	16.6		
12/10/2015	18.5					20.0							
17/5/2017	18.5					19.3							
19/7/2017	18.7					19.4							
28/9/2017												125.5	123.2
6/10/2017	19.2					19.2							
1/11/2017												125.5	123.2
1/12/2017												22.8	20.4
9/12/2017	19.3					19.9							
1/1/2018												125.5	123.2
1/2/2018												23.2	20.6
20/2/2018	19.4					19.9							
1/3/2018												125.5	123.2
1/4/2018												23.2	20.5
1/5/2018												23.4	20.5
3/5/2018	19.4					19.9							
18/5/2018												125.5	
1/6/2018													123.2
16/6/2018	19.5					19.9							
1/7/2018													123.2
9/7/2018	19.5					20.0							
13/7/2018												125.5	
1/8/2018												24.5	123.2
1/9/2018												24.5	20.7
1/10/2018												24.6	20.8
5/10/2018				21.0									
8/10/2018	19.8												
9/10/2018		19.8						35.9					
11/10/2018						19.6			0.8	19.4			
19/10/2018	19.9	19.9	18.0	22.1		21.1	Dry	36.7		19.5			
1/11/2018											Dry	125.5	123.2
17/11/2018	19.9	19.9	18.0	22.1		21.2	Dry	36.7	-18.5	19.9			
1/12/2018											Dry	125.5	123.2
10/12/2018	20.0	20.0	Dry	22.1		21.2	Dry	36.7	-19.7	19.6			
1/1/2019											Dry	125.5	123.2
24/1/2019	20.1	20.1	Dry	22.0		21.2	Dry	36.7		19.7			
1/2/2019											Dry	125.5	123.2
25/2/2019	20.1	20.2	Dry	22.2		21.2	Dry	37.0		19.7			
1/3/2019											Dry	125.5	123.2
27/3/2019	20.1	20.1	Dry	22.1		21.2	Dry	37.0		19.8			
1/4/2019											Dry	125.5	123.2
18/4/2019	20.2	20.3	Dry	22.2		21.2	Dry	37.1		19.8			
1/5/2019											Dry	125.5	123.2
13/5/2019	20.2	20.3	Dry	22.1		21.2	Dry	37.1		19.8			
1/6/2019											Dry	125.5	123.2
1/7/2019											Dry	25.1	21.5
2/7/2019	20.3	20.4	Dry	22.2		21.2	Dry		41.7				
24/7/2019	20.3	20.3	Dry		22.0	21.2	Dry		42.7	20.0	Dry		
1/8/2019											Dry	125.5	123.2
20/8/2019	20.5	20.5	Dry		21.9	21.2	Dry		43.3	20.1			
1/9/2019											Dry	125.5	123.2
1/10/2019											Dry	25.5	21.8
12/11/2019	20.7	NM	Dry	21.7	21.6	Dry	Dry	44.1	42.9	20.2	Dry	25.5	21.9
13/12/2019	20.8	NM	Dry	21.7	21.6	Dry	Dry	44.2		20.3	Dry	25.7	22.0
4/2/2020	20.9	NM	Dry	21.6	21.5	21.2	Dry	44.4	43.2	20.4	Dry	25.8	22.1
20/4/2020	21.0	NM	Dry	21.6	21.4	Dry	Dry	44.7	43.3	20.5	Dry	25.7	22.1
1/5/2020											Dry	25.7	22.0
1/6/2020											Dry	25.9	22.0
1/7/2020											Dry	26.0	22.2
23/7/2020	21.2	21.4	No access	21.6	21.4	No access	No access	45.0	43.5	20.7	Dry	26.0	22.2
1/9/2020											Dry	26.0	22.3
1/10/2020											Dry	26.1	22.4
16/11/2020	21.6	21.4	Dry	21.6	21.7	Dry	Dry	44.7	43.8	20.9	Dry	26.1	22.4
1/12/2020											Dry	26.2	22.5
26/1/2021	21.7	21.4	Dry	21.7	21.7	Dry	Dry	44.8	44.0	20.9	Dry	26.2	22.7
1/2/2021											Dry	26.3	22.7
1/3/2021											Dry	26.4	22.8
1/4/2021											Dry	26.4	22.8
19/5/2021	21.6	21.9	Dry.	21.9	23.2	Dry.	Dry.	45.5	44.1	21.2	Dry	26.5	22.9
1/6/2021											Dry	26.4	22.8
1/7/2021											Dry	26.5	22.8
17/8/2021	21.8	22.0	Dry	23.2	24.5	Dry	Dry	45.6	44.3	21.3	Dry	26.5	22.9
1/9/2021											Dry	26.5	23.0
1/10/2021											Dry	26.6	23.0
1/11/2021											Dry	26.7	
1/12/2021											Dry	26.7	123.2
25/1/2022	22.0	22.2	Dry	22.2	25.0	Dry	Dry	39.7	42.9	21.3	Dry	26.4	22.9
10/2/2022	21.9	22.2	Dry	22.2	25.1	Dry	Dry	39.5	42.9	21.4	Dry	26.5	23.0
1/3/2022											Dry	26.7	23.0
1/4/2022											Dry	26.8	23.1
1/5/2022											Dry	26.9	23.2

Date	JMR4WA	JMR4WP2	JMR22WA	JMR22WP	JN1119E	JMR23WA	JMR24WA	JMR24WP	JMR24WP2	JMR25WA	JMR26WA	JP0911T	JP0912T
1/6/2022	21.9	22.4	Dry	22.3	25.0	21.0	Dry	38.4	41.8	21.6	Dry	26.8	23.1
2/8/2022	21.9	22.9	Dry	22.8	26.3		Dry	39.0	42.0	Dry	Dry	26.6	23.0
6/10/2022	22.0	22.3	Dry	22.9	26.3		Dry	42.7	42.7	Dry	Dry	26.5	23.0
16/2/2023			Dry	22.7		19.6	Dry		42.5	21.2	Dry	26.6	23.1
1/3/2023											Dry	26.6	22.7
1/4/2023											Dry	26.5	22.7
16/5/2023	21.9	22.2	Dry	23.1	27.1	19.5	Dry		42.6	21.3	Dry	26.5	22.7
1/6/2023											Dry	26.5	22.7
1/7/2023											Dry	26.5	22.7
14/8/2023	22.1	22.2	Dry	23.2	30.0	19.7	Dry		40.7	21.5	Dry	26.7	22.8
1/9/2023											Dry	26.8	22.9
1/10/2023											Dry	26.9	23.0
21/11/2023	22.2	22.4	Dry	25.3	28.1	19.9	Dry		39.6	Dry			
8/2/2024	22.2	22.4	Dry	25.6	27.5	19.9	Dry		38.9	21.6			
8/5/2024	22.3	22.5	Dry	26.6	27.8	19.9	Dry		41.0				
6/8/2024	22.3	22.5	No access	No access	No access	20.0	Dry		41.7	Dry			
5/9/2024	22.3	22.5	Dry	24.2	27.9	20.0	Dry		41.7	Dry			
16/11/2024	22.4	22.6	No access	No access	No access	20.1	Dry		No access				